

BUSINESS MODELS IN THE DIGITAL GOODS AND SERVICE INDUSTRIES

Research of Digital Businesses and Associated Value Capturing Mechanisms

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ABSTRACT

This thesis examines the digital goods and services industry from the point of view of the common business models companies utilize to capture value from their products. As digital products have become an everyday part of life for more and more people globally, the underlying value capturing mechanisms that support the industry are deserving of extensive examination. These business models are found to be able to be divided into four categories of free offering, freemium, premium, and platform business models. This categorization is reflected by digital products in prominent markets like Google Play Store and the Apple App Store. A meta-analysis of academic research data in combination with current statistics seemingly implies that the market for digital products is transitioning into further favoring initially free products over so-called premium business models with some differences between hedonic and non-hedonic digital products. A market largely devoid of initial monetary costs to consumers and which relies on non-monetary costs to consumers like advertisements as sources of revenues, can have implications on both microeconomic and macroeconomic scale. On a small-scale, digital business models and their perceived trends influence the monetization and market entry to digital goods and services markets in general. On the broader scale, digital business models may even go as far as influencing the overall accuracy of GDP calculations by creating welfare not necessarily captured by traditional price indexes.

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1. INTRODUCTION

1.1 Background

One of the distinctive characteristics of the beginning of the 21st century has been the increasing role digitalization and digital goods and services play in the lives of people worldwide. The development and increased availability information and communication technology (ICT) has led to a situation, where especially in the most economically prosperous countries of the world, digital products have become a large part of everyday lives of hundreds of millions of individual consumers. Nearly all young and working age consumers in developed nations consume or come in contact with digital goods and services daily, for example, in the form of computer software or mobile applications. In addition, it would be difficult to find a business of any significant size which in some way is not reliant on digital goods and services in order to maintain its operations whether that is through digital banking services or software built to track and manage complex supply networks around the world. Not to even mention some digital innovations like e-mail and the internet in general, which have become almost ever-present in global corporate cultures.

The spread of digitalization worldwide and the increasing accessibility of the technology created a large market for creating and providing digital goods and services for both consumer and business entities. Especially during the 2010s the digital goods and services industries have grown to encompass a more noticeable part of the entire global economy than before. According to Statista (2020), in 2019 digital commerce between businesses and consumers amounted to US\$ 3,391,727 million. Furthermore, according to their estimates, the value of digital commerce is poised to reach US\$ 4,5 trillion by 2023. It is also forecasted that the consumer base of digital commerce reaches the threshold of 4 billion people in early 2020s. These figures, if assumed accurate, are made all the more significant by the fact that the calculations leave out digital goods and services sold between businesses, which is a large market in addition to digital goods and services marketed at individual consumers. Digital goods and services are also an area of economy where innovation is a priority for many companies which could indicate that continuous growth is based on a fairly stable ground in terms of business growth philosophy.

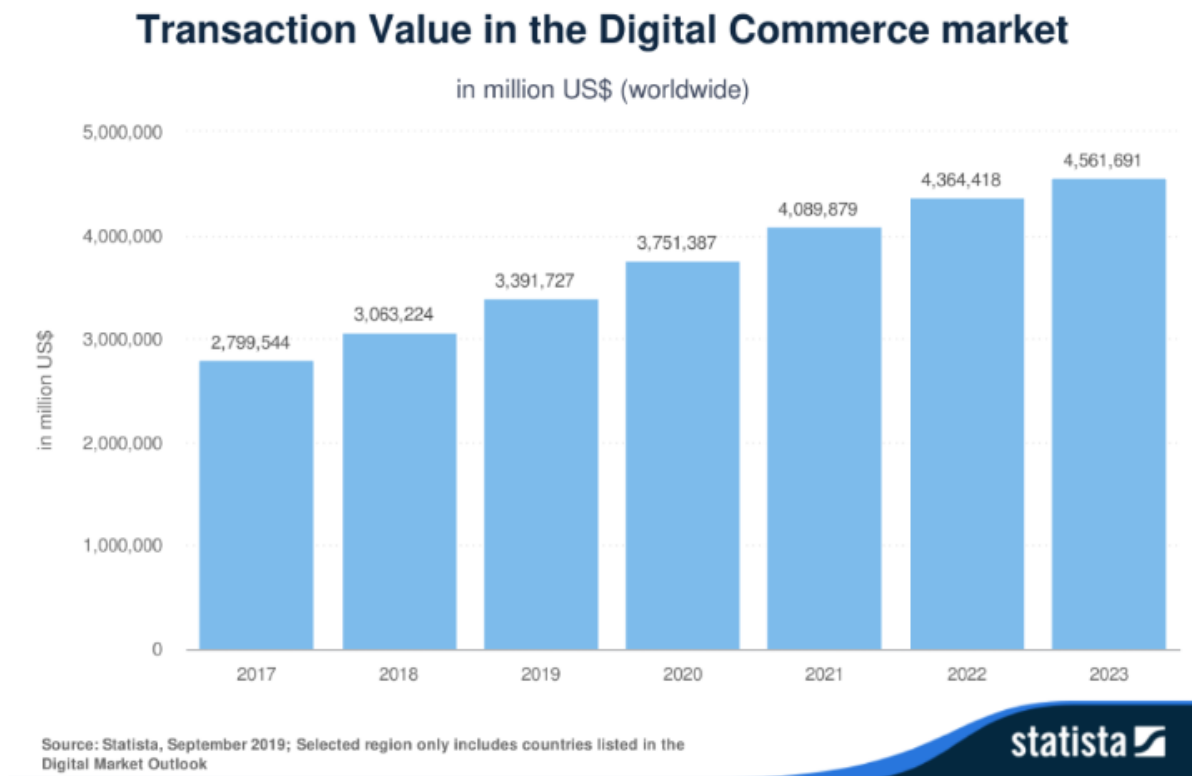


Figure 1: A graphical representation of the transaction value perceived in the digital commerce market worldwide as per data from Statista (2020)

The development and sale of digital goods and services is central to the operations of some of the largest and most valuable companies in the world today like Amazon, Alibaba Group, Alphabet Inc. (Google), Apple, Microsoft, and Facebook. Not to mention the fact that digital start-up companies like Airbnb and Uber have managed to gather some of the largest investment capital sums in history. These are just some of the reasons why research into business models employed by companies such as these and the business models associated with digital products is more relevant than ever in the field of economics. Although relatively large amounts of research has been conducted into the digital goods and services markets, most of it is from the point of view of management or marketing studies rather than from the economics perspective. This is the knowledge gap this thesis aims to at least partially address.

How the business models associated with digital goods and services differ from other companies and how can it be that the digital goods and services markets have produced some of the most successful companies in the world? These are just a couple of the large question which seemingly may lack concrete answers at the time

of writing. In the center of this query is the way in which digital companies are able to efficiently monetize their goods and services to consumers. How and why many companies seemingly have started to prefer offering free versions of their products over demanding direct payment for their customers and whether there exists a superior business model for digital goods and services over the alternatives?

1.2 Research Problem

The research problem is concerned with the examining and documenting trends associated with business models in the digital goods and services markets. How companies in this market monetize their products in order to maximize the value creation potential of their offering to consumers. The digital goods and services industry differs even on the surface level from more traditional markets but as digitalization permeates through more and more aspects of business it may even provide some potential for forecasting future market conditions on a broader scale. As the relative size of the digital goods and services market grows, there has been some research in this sector of the global economy but there still is a void when it comes to universally agreed upon models. This may be due to the market being relatively new or because it has gone through rapid changes along with the development of the enabling technology behind it in the start of the 21st century.

There is also going to tentative exploration whether there is a model which could be considered superior to alternatives in the market currently, given the overall trends perceived in the markets and differences between various revenue models. Currently there seemingly exists a gap in available research regarding the mapping and categorization of business models utilized by companies in the digital goods and services industries.

1.3 Research Questions

The problem of the thesis is addressed through three definite research questions. These questions are the following:

- What are the prominent business models of digital goods and services markets and what are the main revenue streams and value capturing mechanisms associated with different business models?

- What are the prominent trends present in the digital goods and services markets when it comes to favoring certain models over relevant alternatives?
- Are there revenue models that could be considered superior dominant when compared to the relevant alternatives?

Given the scope and time and overall resource limitations of the bachelor's thesis, these questions are mostly going to scrape the surface of the industry it is examining but in combination, answering these questions should result in a reasonably clear theoretical picture of the digital goods and services market and the business models present in it. They may also provide insights for further analysis.

1.4 Research Objectives

The research objectives follow and expand on the relevant research questions stated above and can be divided into two distinct categories. The first set of objectives aims to establish a theoretical base for the second set of objectives to be met through mostly research involving secondary sources of data and meta-analysis of relevant research conducted before.

Firstly, the aim is to distinguish the different revenue models in the digital products markets and to gain the ability to classify products according to their combined value capturing mechanisms. Furthermore, the thesis aims explore the sources of revenue associated with different value capturing mechanisms in order for categorization to be made possible.

Secondly the thesis seeks to examine whether there exists a dominant monetization model currently in the market and seeks to determine if there has been a noticeable trend or shifts in the business model preferences within the industry in the 21st century. Finding a dominant model and a tentative explanation into why a seemingly dominant model exists would be in the interests of both academia and business at large.

1.5 Definitions

The first set of objectives aims to establish a theoretical base for the second set of objectives to be met through mostly research involving secondary sources of data and meta-analysis of relevant research conducted before.

Business model

The business model of a company is concerned with the way a company delivers and captures value and by extension revenue through the good or service they offer to the consuming customer. The business model of a company is concerned with the specifics of the internal operations of the company only on the surface level but provides the necessary depth of analysis for making some overarching observations on the nature of the market. It can also show the perceived trends of value creation techniques and value capturing mechanisms among competing companies in a given market.

A more in-depth analysis of the definition of a business model within the context of the thesis research is conducted within the literature review portion of the thesis.

Digital goods and services

In the context of the thesis digital goods and services are defined as business offerings which are sold and purchased in a digital format mostly through the internet. These kinds of goods and services are used electronically. The transactions in the digital goods and services market may take place between businesses and consumers (B2C), businesses and businesses (B2B), or consumers and consumers (C2C) with a business being the facilitator of the transaction. Digital goods and services are exemplified but not limited to computer software, digital media, streaming services, and digital service platforms.

Information and communication technology (ICT)

Information and communication technology (ICT) is commonly defined as encompassing all technologies involved in handling information and

aiding communication. In the context of the thesis ICT mostly relates to the internet and digital communication between computers and mobile phones as they are the common access point for consumers into the digital goods and services markets. In addition, the infrastructure technology associated with providing capabilities for exchange of information and communication like internet access to consumers is considered to be a part of ICT as a whole.

2. LITERATURE REVIEW

2.1 Introduction

For the purpose of this thesis, the following literature review has been divided into three separate theoretical sections:

Firstly, the concept and definition of a business model within the operational context of the thesis and the relevant research questions are going to be discussed. The aim of the literature review, for this section, is to shed a light to the history and scientific discussion surrounding the term in order to find a fitting operational definition for research purposes. This approach is born out of necessity as no distinguishable scholarly consensus has been reached on what could be considered a definitive definition of a business model. Most definitions currently on offer could be considered made to fit certain disciplinary viewpoints and purposes. Therefore, the definition of a business model may be different in nature, for example, from the point of view of management scholars compared to writers researching and discussing business strategy.

Once an applicable definition for the purpose of the thesis is identified, on the second theoretical section, the forms of business models perceived common among digital goods and services are discussed. Their specific differences are going to be identified and the business models are categorized based on the various distinct factors related to the value capturing mechanisms built to utilize different revenue sources. This categorization results in the distinction and examination of four different main categories namely premium, freemium, free offering, and platform business

models. Some discussion on business model trends perceived in digital markets is also going to be present as significant transitions to favoring certain business models over others are present in some areas of the digital goods and services industries. Some potential underlying causes to these perceived trends is also discussed.

Finally, the perceived rising economic prevalence of digital businesses and the novel ways they create value, and consequently revenue, are examined within the contexts of micro- and macroeconomics. For the purpose of the thesis it is beneficial to attempt to contextualize some aspects and effects digital business models and trends associated with them have on individual companies and the economy at large to examine the effectiveness of the different business models. The implications of adopting digital business models and their consequences are examined from the effects digital business models have on the companies that utilize them to the implications that more prominent digital businesses adopting digital business models may even extend to and challenge the ways national GDP and welfare created by companies should be measured.

Furthermore, as the discussion on the production and productivity associated with digital goods and services bears a striking resemblance to discussions on the issues brought up by previous leaps in information and communication technology (ICT), namely the perceived lackluster rise in productivity brought on by the introduction of computers in the 1970s and the rise of internet in the 1990s, the current potential concerns can be thought of as a modern form or iteration of a productivity paradox. This serves to add a further layer of exploration to the relationship between digital business models and productivity.

The theoretical sections are going to be followed by a construction of a conceptual framework which aims to create a concise visualization of various digital business models and the immediate and secondary sources of revenue associated with them. The final section of the literature review will consist of a conclusion of the prominent theories covered and their relationship to the thesis topic. In addition, further research into some specific aspects of the theoretical topics discussed within the literature review is going to be proposed.

2.2 Business model definition for digital goods and services

For the purpose of this thesis, digital goods and services are to be defined as follows; Digital goods and services are products which can be delivered to a consumer by utilizing information and communication technologies and infrastructure like the internet. Common forms of digital goods and services include but are not limited to on demand services, streaming services, digital media, computer software, and mobile apps. A digital product is a non-physical good or service which is often distributed to consumers online through various digital platforms instead of relying on physical sale or retail. The business models which are utilized to capture value from the digital good or service from the point of view of the creator of said product is the area of interest for the research.

2.2.1 The rise of the term alongside the internet

As a term, business model has risen to relative prominence within both academic and professional discourse at the late 1990s and through the turn of the century. (Osterwalder, Pigneur, and Tucci, 2005; Zott, Amit, and Massa, 2011). Although the first mention of the term, in a published academic work, can be traced back all the way to the 1970s, the perceived exponential increase in mentions, in both academic and non-academic journals, of the term business model could conceivably be tied to the similarly timed growth of internet based businesses as suggested by Zott et. al (2011). This would make sense, as the utilization of the internet for business created new types of companies, industries, and markets. The likes of Netscape and e-bay along with other large internet companies of the late 1990s were different from anything seen before due to their reliance to the internet in securing revenue from their operations. The new business possibilities enabled by the internet and the consequent ways or “models” created to do business online, would merit a need for a term to discuss the means with which companies were competing within the internet landscape. Of course the term business model is applicable beyond companies focused solely on digital goods and services to all businesses, but in terms of purely becoming a more common term than before, business model as a concept could be considered somewhat tied to the internet and the subsequent rise of more sophisticated and widely accessible ICT around the turn of the century.

2.2.2 The search for a definition in the 21st century

While the term business model rose to become a part of academic and non-academic writing and discussion on business within and outside the context of the internet at the turn of the century, it was seemingly difficult for academic authors of many disciplines utilizing the term to find an academic consensus on a specific definition for it. In their articles Zott et. al (2011) and Osterwalder et. al (2005) point out the lack of a universal definition for the term at the times of writing and the differences across disciplinary lines which may indicate a certain operationalization being done to the term according to the disciplinary perspective of the author using the term. For example, an author focused on business strategy may have defined the term with a greater inclination towards the specific operational aspects of a business whereas an author writing from the perspective of management studies may, in their definition, emphasize a more broad perspective of an overarching value creation logic of a given company. At the start of the 2000s, in the absence of a universally accepted definition, the term seemingly went through a phase of providing means to an end for authors studying a wide range of economic disciplines. There was however a trend which pulled the business model concept from focusing and encompassing all the value creating processes of a business to covering only the main value creation logic of a given business at the start of the 2010s.

Perhaps a good indicator of the somewhat-tumultuous evolution of the business model's definition can be seen in the difference between the two universal definitions offered by the two separate articles one written by Osterwalder et. al (2005) and Zott et. al (2011). In 2005, the term business model was defined more as being an operational blueprint of how a company operated and incorporated the processes which allowed it to do business. This definition can be argued to have taken a lot of influence from discussion on business strategy as the definition could be most useful for analysis purposes if one was to investigate the intrinsic business strategy of a given company. In their paper published in 2011, Zott et. al note that they perceived a transition to definitions of business model term that emphasize a "system-level, holistic approach to explaining how firms 'do business'." (Zott, Amit, and Massa, 2011) This definition of the term is often worded as follows: "A business model describes the rationale of how an organization creates, delivers, and captures value." (Osterwalder and Pigneur, 2013) This definition has taken a step back from

business strategy analysis into painting a more rounded picture of the logic with which a company creates and captures value through interactions between supplier and consumer. Zott et al (2011) argue that the definition of a business model saw a transition from depicting the entire analyzed strategy of a company into being a unit used in the analysis of a company where different business models could be categorized and further treated as variables of analysis.

The more holistic definition of a business model has seemingly become the most common definition for the term as a point of reference especially when discussing the revenue generation and value creation/capturing logics of digital businesses (Cristofaro, 2019); (Teece and Linden, 2017); (Vaudour and Heinze, 2019); (Ahmad et. al, 2020). Therefore, for the purpose of the thesis, the definition used by Osterwalder and Pigneur from 2013 will be used as it seemingly best suits the purpose and constitutes the most common definition of the term used in related literature on pertinent subject matters.

2.2.3 Further categorization of business models

The work of Osterwalder and Pigneur is not only limited to the definition of a business model. In their book, *Business Model Generation*, they map out nine distinct building blocks which can be used to distinguish the nature of a business model for a given company. According to the authors these nine building blocks provide a framework which can be used to build, analyze, and categorize business models. These building blocks are customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure (Osterwalder and Pigneur, 2013). The categorization of specific business models would be done according to the differences in the ways different business models interact with the different building blocks. Differences in what building blocks are focused on more than others and where the emphasis of a company lies could conceivably be reflective of where a business model derives most value from compared to the competition. None of the individual building blocks can be considered to be entirely new concepts for disciplines of business and management studies, but analyzing the operations and internal processes of a company through the perspectives represented by the different blocks could create a quite

comprehensive picture of the operations and the overarching logic of a company in their search to create and capture value.

In 2012, Schön, looking to categorize business models in a similar vein to Osterwalder and Pigneur, condensed the building blocks of a business model into three main categories of interest for business model development. As adapted by Teece and Linden (2017), these categories are value proposition, revenue model, and cost model. Extensions to these categories can be made with value proposition encompassing areas of operations like product and service, customer needs, and geography. Revenue model encompasses pricing logic, channels and customer interaction. Finally, the cost model category contains core assets and capabilities, core activities, and partner networks. By utilizing these three categories, in examining existing business models, a fairly deep analysis into value capturing logics is possible even from an external observer's point of view. Compared to the nine building blocks outlined by Osterwalder et. al (2013) the more concise three-way categorization of Schön (2012) could be considered to better serve the business model concept as a unit of analysis as the three categories provide the potential for variability in business model differentiation for the purposes of academic research. On the other hand, the nine building blocks model may be more useful in creating and developing business models which is one of the proposed uses by Osterwalder et. al.

2.3 Business model types and revenue capturing mechanics of digital goods and services

As a part of research into the evolution of business models of mobile applications, Cristofaro (2019) argues that finding the right business model is pivotal for the success and survival of companies in markets of digital goods and services.

Companies seemingly need to create and capture value in new ways in response to quickly changing markets. Taking into consideration the sometimes-volatile pace at which innovations are introduced in the forms of leaps in technology and the introduction of new business models sometimes resembling more of a discovery driven system rather than a system of incremental improvements (McGrath, 2010) this would seem like a reasonable argument.

In an article published as a part of the Hawaii International Conference on System Sciences 2020, Ahmad et. al have proposed that a digital business model has two defined characteristics. Firstly, a digital business model incorporates a business logic which deliberately acknowledges the digitization and its characteristics and aims to take advantage of them in both internal operations and external interactions with customers and business partners. Secondly, a business model can be considered digital if changes in the available digital technology trigger fundamental changes in the ways business is carried out and revenues from said business are generated (Ahmad et. al, 2020). According to these distinctions, companies like Facebook and Amazon, which in themselves constitute some of the largest individual companies in the world at the time of writing employ almost purely digital business models for most of their operations. These examples and other similar companies do business which is closely tied to the advances made in technologies such as the internet, computing, and mobile phones. The sale of digital goods and services is also tied to advances in technologies enabling the existence of the industry. Therefore, it can be argued that the business models of companies producing, distributing, and selling digital goods and services can be considered digital business models.

The developments of the internet and the accompanying consumer accessible hardware and internet infrastructure have made new forms of business models viable that would not have been either possible to execute or profitable in the past. This can especially be seen within the realm of digital products downloadable from the internet like computer software and mobile apps. The following subsections look to classify the common business model categories among the digital goods and services industries according to the different main value capturing mechanisms that are innate to them. Namely these four categories of digital business models consist of premium, freemium, free offering, and platform models.

2.3.1 Premium business models

While other viable business models exist, some digital goods and services are monetized through a conventional premium business model. This is akin to the common way companies sell physical products in exchange for given price to the consumer and derive the majority of the company revenues from the initial sale transaction between the seller and the buyer. The key distinctive factor of a premium

business model is that the consumer must pay for the digital good or service before they can consume or utilize it which is by no means a given in the digital goods and services markets (Lambrecht et. al, 2014). Digital goods and services which charge a set subscription fee for access to the product are also considered to be utilizing a form of a premium business model. Although alternative business models have gained prominence in the markets, premium business models are still widely utilized among some specific digital good and service subindustries like subscription streaming services. A good example of a large company utilizing a premium business model in selling their digital service is Netflix.

2.3.2 Freemium and free offering business models

In the digital goods and services industry, the interaction between a business and a consumer does not necessarily need to rely on the buyer paying for the digital product with a predetermined amount of money for the seller to guarantee the transaction does not constitute a potential loss. In the sale of digital goods, the consumer can offer money, time, or their information in exchange for the sellers offering (Lambrecht et. al, 2014). Instead of directly paying an explicit price or a subscription fee for the digital good or service, the main revenue stream of a company may be born out of the data the consumer allows for the company to gather through the offered digital product. Another prominent way of forgoing purchase price is to collect add revenue from advertising companies in exchange for showing advertisements to the users of the digital product. The ways companies execute business models based on free offering of a digital good or a service may vary. The major distinction one can make is the difference between a freemium business model and a free business model.

The underlying logic of a freemium business model is that a consumer is provided with a free version of a digital product, mainly for sampling purposes to alleviate the buyer's hesitancy to pay upfront for a product without knowing the value or utility provided by the offering. In most cases the free version is fairly limited in options compared to the premium version which the consumer can access by paying a one-time fee or starting a paid subscription after having had the chance to use the free version. For example, many media companies such as newspapers have started to offer a set amount of free articles on their websites for the similar purpose although it

can be difficult to determine how much of a product should be made free in order to maximize profits (Halbeer et. al, 2014).

Because the percentage of consumers which eventually transition from the free product into paying for the premium version can be very small, approximately 1-2% according to the case studies researched by the European Commission (2015), many companies have chosen to try and capture some of the lost revenue by in addition utilizing revenue sources which completely free business models take advantage of like advertising and the gathering and sale of user data.

Using an advertising business model can be considered to be the most common way a digital good or service company can monetize a seemingly free offering or a free version of a product. The ad revenue is collected from third party advertisers, therefore the provider of the digital good or service is selling the visible access to their consumer base. Some digital businesses use bidding wars for companies where the highest bidding advertiser gains the most visibility within the digital product (Lambrecht et al. 2014). Another way to monetize a free digital offering is to gather user data about customer behavior through the product and selling said data to third parties which will use the information for their own purposes (Lambrecht et al. 2014). These purposes often include but are not limited to personalized advertising where the advertisements a consumer is exposed to are tailored to fit, for example, recent internet search patterns. A third option for gathering revenue from a free digital product is to use a microtransaction business model by providing a possibility for micropayments. Micropayments are small fees a consumer can pay in exchange for some form of functionality or a virtual good in the digital product (Roma and Ragaglia, 2016). For example, a mobile game can implement an arbitrary timer which a customer can skip and continue playing the game immediately in exchange for a set small amount of money, a micropayment. Due to their nature micropayments and the microtransaction business model is common with hedonic products like videogames (Vadour and Heinze, 2019).

The key difference separating a freemium business model and a free model is that a free offering has no premium option available for consumers. Beyond the perceived lack of a premium option however, in many cases, the lines between free and

freemium can become blurry when it comes to taking advantage of revenue streams (Lambrecht et. al, 2014). If a company chooses a freemium or a free offering business model, it is often common for them to not rely on a single revenue source but to combine multiple sources of revenue as their value capturing mechanism. In their paper, Teece and Linden (2017) theorize that while there exists a finite number of sources of value, a near infinite amount of different combinations in capturing value exist as well from said sources related to individual combinations of capabilities inherent in different businesses. These individual business models and their value capturing mechanisms are however considered to be moderated by trade-offs between different revenue streams (Lambrecht et. al, 2014) (Cristofaro, 2019). If free offering aims to take advantage of both advertising revenues and gathering of consumer data, increasing the amount of advertising may lead to the product or service becoming less appealing to new and existing users. Therefore, increasing the amount of advertisements can lead to a smaller userbase for the product which in turn makes data gathering less profitable. Vice versa, less advertisements on a free digital product leads to less ad revenue but a possible increase in users may offset the loss with increase in revenue captured from data gathering. These tradeoffs also exist between different business models as a premium business model with upfront payment is expected to lower the capacity for market penetration of a digital product due to free alternatives. Therefore, any attempts at capturing value through the means associated with free offerings like showing ads or gathering user data would yield lesser returns (Lambrecht et. al, 2014) even when disregarding any potential customer backlash from such actions. Finding the right approach to combining the sources of value is not always apparent and success may vary based on both the nature of the product and the company behind the product (Teece and Linden, 2017).

2.3.3 Platform business model

In addition to the premium, the freemium and the free offering business models there can be argued to exist a fourth model, a platform business model. This model has gained somewhat of a prominence especially in the digital services industry across the 2010s. The logic behind a platform business model is that a company provides a digital platform which facilitates transactions between businesses and consumers or two businesses or two consumers. The main revenue source for the platform provider being a cut or a fee taken from all transactions happening on the platform (Täuscher

and Laudien, 2018). A platform can be created to facilitate the sale of goods between individuals like E-bay or to facilitate sale of services between users like Uber. Even the platforms on which most sales of digital products take place like Google Play Store and Apple App Store work based on the platform business model with Google for example taking a 30% share of transactions facilitated by the Play Store (Roma and Ragaglia 2016). There have been attempts to divide the platform business model into subcategories (Täuscher and Laudien, 2018) based on, for example the type of goods sold and purchased on the platform and whether the transactions happening on the platform take place between two companies or two individual consumers without the legal distinction of a sole proprietor. However, an overarching defining attribute for a platform business model seems to be that the two parties interacting on the platform assume the roles of a supplier and a customer with the company which provided the platform for said interaction only taking up the role of a facilitator.

Regarding the competition in the digital goods and services markets, there are many potential external factors, beyond only the business model, influencing whether a given digital product is a success or a failure. A great deal of literature has focused on the relationship between individual consumers and the service and how phenomena like herding behavior (Ling, 2019) and increased visibility within a marketplace (Carare, 2012) can influence the financial success of a digital product. Due to the potentially greater commercial success associated with greater visibility, some platform business models, typically platforms which can be considered marketplaces for goods sold by third parties, have captured revenue by accepting payments from sellers in exchange for greater visibility on the platform (Cristofaro 2019). While similar in nature to conventional advertising, the implementation of the promotion as a part of the platform itself makes it different from adds of products and services external to a given platform.

2.3.4 Trends in digital goods and services markets

According to economics literature, a free good is defined to be an item of consumption without scarcity, which means that the good is available in abundance and when a single consumer attains and consumes the good it does not lessen the availability of said good to other consumers. Since after the creation of a digital product the economic costs or reproducing the product is nearly negligible, a digital

good or service, in some cases, can constitute a form of a free good if the creator of the digital product chooses to utilize a free offering business model if non-monetary costs associated with the product are not considered to be economic costs to the user. Therefore, the perceived rise of free and freemium could be the tandem result of advanced technological capabilities and the innate nature and cost structure and “free” availability of digital goods and services compared to more traditional physical products.

As discussed by Lambrecht et. al (2014) a driving factor in this transition to favoring “free” models perceived within digital goods and services industries is quite likely the fact that digital goods are non-rival, which means that a customer consuming them does not restrict the availability of the product to others. Other related factors contributing to the potential for free models are the close to zero marginal costs associated with distribution and production as most digital goods and services are distributed and sold as identical copies of an initial code downloaded from the internet. According to the Business Innovation Observatory (2015), which operates under the European Commission, the nature of digital goods and services is also suited to freemium models because the aforementioned factors make the marginal cost of adding a consumer to the customer- or userbase of a digital product is fairly negligible for the seller beyond potential promotional costs. For these reasons, it can be argued that digital goods and services bear some resemblance to free goods for the consumer from an economics perspective and therefore have a competitive advantage to premium model digital products which from the perspective of a consumer constitute an economic good to them as they are required to incur an economical cost in exchange for the consumption of said good. It can be assumed that it is difficult for an economic good to compete with a free good if both alternatives provide the same amount of utility for the consumer.

Furthermore, Niemand et. al (2019) argue that the prominence of free alternatives has had a consequential effect on the consumers expectations. The rise to prominence of the freemium models has led to an increase in two particular assumptions becoming prevalent among consumers. Firstly, there may exist an expectation that all digital services if not entirely provided free of initial cost should have a free version available. Secondly there may exist an expectation which

dictates that increased price automatically leads to higher quality or received value from a given product (Niemand et. al, 2019). This is something companies in the digital industries may have already incorporated as a part of their operational logics.

Potential oversaturation of the competitive markets with free offering and freemium digital products may play a part in why premium business models only amounted to 10% of available applications and why up to 90% of profits were made by free apps according to industry reports (AppBrain 2019). By making an application free for a customer to test it, it serves to alleviate some of the potential uncertainty from the part of the consumers and also provides greater potential for market penetration for a digital good as the cost of sampling for a consumer is made close to negligible. From the consumer point of view, the perceived value gained from a digital product is an important determinant in whether a customer starts using it. The consumer's attitude towards nonmonetary costs can play a large role when it comes to the success of free service offerings (Hüttel et al, 2018). Zero-price effect, i.e. the situation where a product is seemingly free for the customer to consume, can often elicit a positive response in consumers. Two phenomena associated with zero-price may have an effect on free digital products becoming more prominent. Benefit inflation effect, where benefits of free services are overemphasized by the consumer, and the cost deflation effect, where non-monetary costs are perceived as lower with free offerings (Hüttel et al, 2018). Cost deflation effect can, for example, lead to consumers being more accepting of even intrusive advertising within a digital product when there has not been a required initial purchase price when acquiring said product. It may be that consumers are more responsive to premium pricing than they are to the non-monetary costs of a product since they may be considered less explicit and apparent to the user of a product.

Despite the trend of favoring a free business model, there does not seem to exist empirical evidence which would suggest that a certain business model, such as free offering despite its prominence, could be considered superior to all others. The use of different value capturing mechanisms is seemingly more tied to the nature of the digital good and service and what kind of customer segment it is made for (Cristofaro, 2019). The aspects of the nature of the product which could determine the most suitable business model are seemingly unknown.

2.4 The economic effects of digital business models

2.4.1 Microeconomic effects

2.4.1.1 Effects on productivity and the productivity paradox

The relationships between developments in information and communication technology and measurements of productivity and gross domestic product have been a subject matter of a lot of interest. Especially extensive has been the discussion around the so-called Solow's productivity paradox (Brynjolfsson and Hitt, 1998), (Triplet 1999), (Watanabe et. al, 2016). The discussion on a productivity paradox (Brynjolfsson and Hitt, 1998), relates to the perceived issue that while from 1960s onwards the prominence of computers as parts of business and the overall US economy had risen considerably, there had been a worrying trend of diminishing measured productivity growth within the US economy going hand in hand with the rapid development and increased accessibility of computers. The name 'Solow's productivity paradox' was inspired by a statement made by Nobel laureate Robert Solow that the age of computers can be seen everywhere except in the productivity measurements. This raised question over whether computers and information and communication technology were contributing to productivity or were the measurements themselves missing the contributions computers made to the economy and companies within (Triplet, 1999). Some of the explanations which were considered viable included also the possibilities that the steep learning curve associated with utilization of computers contributed to a latency effect of results seen as greater productivity growth, redistribution of profits from computer utilization, and the potential explanation that bad IT-management were to blame for the perceived lackluster growth in productivity (Brynjolfsson and Hitt, 1998).

While there exists evidence heavily suggesting that computers do contribute to overall productivity (Triplet 1999), no clear and universally accepted explanation seems to exist as to why developments in information and communication technology can not directly be seen contributing consistently to increased growth in productivity.

In a paper published in 2018, Watanabe et al, discuss a similar phenomenon being witnessed as a part of expansion of the internet in the late 1990s and the subsequent

expansion of digital goods and services especially those accessible through mobile devices in the 2010s. According to the paper, the economy as a whole has witnessed a significant decline in the growth of productivity despite the perceived potential for increased productivity assumed to be intrinsic in the expansion and more efficient utilization of information and communication technologies on both occasions. This finding has led to speculation whether the current models of calculating GDP are up to the challenges presented by the new forms of digital business models of digital goods and services companies.

2.4.1.2 “Next-level” competition and monopolization mentality

Teece and Linden (2017) suggest that digital enterprises are engaged in “next-level competition”. They describe it as dynamic competition marked by a semi-globalized world, multi-invention context, the prominence of business ecosystems, and the fact that organization capabilities play a bigger role than before. The semi-globalized world refers to the fact that although total globalization is not something companies need to actively deal with at this moment, the competition and potential sources of innovation are more dispersed than before with new countries like Taiwan, South-Korea, and China having gained the capabilities to foster companies capable of challenging Japanese, European, and North-American companies which historically had the greatest capacity innovate and compete in the global stage. Although some concentrations of innovations still exist, due the effects of globalization there are little geographical limits to where the next innovation or a leading company may originate from as access to more extensive information and communication technology and infrastructure broadens globally. Multi-invention context refers to the fact that new innovations, especially within the realm of technology, may rely on hundreds of preceding smaller innovations and inventions that make the new developments possible. This has seemingly added a new layer of complexity to both the creation of innovations and the capabilities a given company needs to remain competitively innovational. In addition, the competitive advantage brought on by innovations in the digital goods and services industries is subject to spillover effects (Oxford Economics, 2017) where it is relatively easy for competitors to copy and adapt new innovations into parts of their operations and business models. While this can contribute to the productivity of companies and industries as a whole, since most beneficial innovations can often be accessed and implemented by most competitors

in the industry, it may also make finding substantial and more so sustainable competitive advantages through innovation more difficult for all companies.

Competition itself is also somewhat different since a good portion of competition is between business ecosystems rather than individual companies (Teece and Linden, 2017). A good example of this could be the competition between Apple and Samsung. Both companies have created business ecosystems based on their hardware and the associated operating systems. Therefore, companies developing their products for a given operating system are in fact part of a business ecosystem associated with either Apple or Samsung. While they do compete against other software developers, they also participate in the competition between Apple and Samsung. All these factors have led to a situation where differentiating individual capabilities of specific companies have risen to the forefront of competition among digital goods and services companies. Long term, looking to stand out from the herd can prove to be one of the few sustainable ways of capturing competitive advantages.

As sustainable competitive advantages are seemingly scarce, Teece and Linden (2017) argue that due to the competitive environment of this nature, many companies focus on the growth of their user base rather than the growth of their financial profitability. In some industries it would appear that a winner takes all mentality has developed where a company may secure a monopolistic market share with a large enough userbase. The aim being that a company with the most users gains the most public interest and eventually becomes almost automatically associated with providing a certain function for the consumer which in turn would disadvantage any alternative providing competitors. For an example companies like Airbnb, Tinder, and especially Uber have become somewhat synonymous with the respective services they offer. Therefore, in some cases in the digital goods and services markets, companies may emphasize the size of the company in favor of the profitability of the company. The underlying logic being that once a dominant market position is secured, the company can be made profitable by utilizing a monopolistic market position. A dominant market position can also lead to a situation where a company can take advantage of stand-out capabilities of smaller companies through acquisitions and headhunting of important employees.

2.4.2 Macroeconomic effects

2.4.2.1 Direct income effect

When making access to a good or a service monetarily free for a consumer, theoretically it is difficult to anticipate the relationship between a free good and income effects. The theoretical expectation of the correlation between income and consumption from the point of view of the consumer is that when the financial income of a consumer rises, so does the amount that given consumer engages in consumption of goods and services and given the appropriate circumstances may transition into consuming higher quality goods. A free offering service relying on advertising or data gathering as the means of capturing revenue may not be influenced directly by the income effect as the non-monetary costs to the consumer are measured in time spent rather than money spent and differences in quality of alternative products can not be determined according to price as most if not all alternative products are all free.

The issue with the freemium and free offering business model is the perceived difficulty in accounting for quality of products and services when those products lack an explicit price. The issue GDP measurements have with quality and pricing is that leaps in quality are not all that often directly reflected in the price of the product of superior quality. Therefore, it can be assumed that the leaps in quality and the resulting greater productivity, as it relates to greater quality of a produced good, is uncaptured by the means of GDP measurement currently in use. In a longitudinal sense, market prices can not necessarily accurately reflect the changes in quality therefore misleading statistical results may arise due to this disconnect between quality and pricing (Watanabe 2018). Making the initial product entirely free, can serve to escalate this issue further as the productivity of a company is measured according to revenue which complicates proceeding as the reporting of revenues by companies is largely based on trust that the information provided by the company is accurate (Robbins, 2018).

2.4.2.2 Welfare effects for the consumers

While there seemingly is some significant amount of uncaptured value within the economy, it may fall under the increased welfare of consumers created by free digital

services and goods (Watanabe et. al, 2018). Especially with free service culture becoming more prominent the utility derived from said services by consumers could contribute to what could effectively be considered "uncaptured GDP". The consumer surplus in welfare may also therefore be considered at least a part of the reason for the productivity paradox i.e. the diminishing productivity growth.

For an example of the increased welfare provided to consumers by digital goods and services, in the music industry the introduction of streaming services in favor of CDs led to loss of jobs and it diminished the size of the music industry as a whole in terms of productivity. Despite this, consumers do not listen to less music and have therefore gained added welfare from the transition from traditional means of music distribution to the widely available streaming services like Spotify and Tidal some of which operate at least partly with a freemium or a free offering business model.

2.4.2.3 Potential implications to GDP calculations

Ahmad and Schreyer (2016) argue that the accounting methodology of the GDP is fit for its purpose. Their view is that the current GDP measurements take into account all notable forms of business, even those in the digital realm. It is rather the scale at which new platform business models enable peer-to-peer transactions which are an area of concern which could be solved by authorities measuring GDP gaining a better access to data on the transactions made on a given platform like Airbnb. But they too raise concerns over price and quality. One main issue are the price indexes and the potential differences in quality between services provided by traditionally operated businesses like hotels and digital service platforms like AirBnB (Ahmad and Schreyer, 2016).

Whether the measurement of GDP should consider the increased welfare brought on by the development of information and communication technology is another point of discussion. Both Watanabe et. al (2018) and Ahmad and Schreyer (2016) agree that some welfare gains for the consumers are not accurately reflected by the GDP but there is also some hesitancy to change the GDP calculation framework. Rather, it is suggested that there would be a need to develop supporting welfare index calculations to support the GDP in measuring productivity and welfare accurately and to account for potential uncaptured GDP. The GDP in itself is not considered a

measurement of welfare, and perhaps should not constitute one, but given its common place as a measuring stick for countries economical when they are choosing their economic and financial policies, some more accurate measurements of welfare should be considered.

2.5 Conceptual framework

The conceptual framework of business models of digital goods and services revolves around the four base business models of premium, freemium, free, and platform, and the typical value capturing mechanisms associated with them. The business “square” in the middle is connected to the rounded squares representing the base business models using directional connectors. The premium business model is on the left side of the framework and the business models incorporating some form of a free version or an entirely free offering are on the right side of the framework visualization represented by rounded squares. The ellipses represent the main revenue sources. A solid line between a business model and an ellipsis signifies a relationship where a given revenue source can be considered a main source of revenue, where the majority of the value for the business is expected to be derived from. The dashed lines between the business models and the revenue source signify supplemental revenue sources businesses often include as a part of their models in order to maximize their value capturing potential.

The visualization aims to portray the potential for hybrid business models created through the utilization of many different revenue sources. It also intends to exemplify the differences in the models as the premium model is separated from the rest of the models due to mainly relying on paid subscription and a set purchase price as sources of revenue. This kind of reliance on customer paying for a product before using it as a revenue source is lacking with the freemium model which only relies on supplemental sources without a definitive main source. This is due to the fact that even though the freemium model may exist in tandem with an option for a consumer to pay, the rates at which free users choose to pay for the premium option makes it necessary for most freemium models to at least equally resort to relying on advertising and data gathering in order to make a profit. Free models mainly capture value from advertising, data gathering, and micropayments depending on the nature of the business and its product. Lastly the platform business model, while

supplementing overall revenues from advertising and data collection, mainly operates relying on revenues derived from transaction fees gained collected from the users of the platform. Platform business model also has access to the supplemental revenue source of paid preferential product promotion on the platform itself similar to advertising. The colors of the ellipses are made to correspond with the business model that can be considered to utilize them as a main source of revenue.

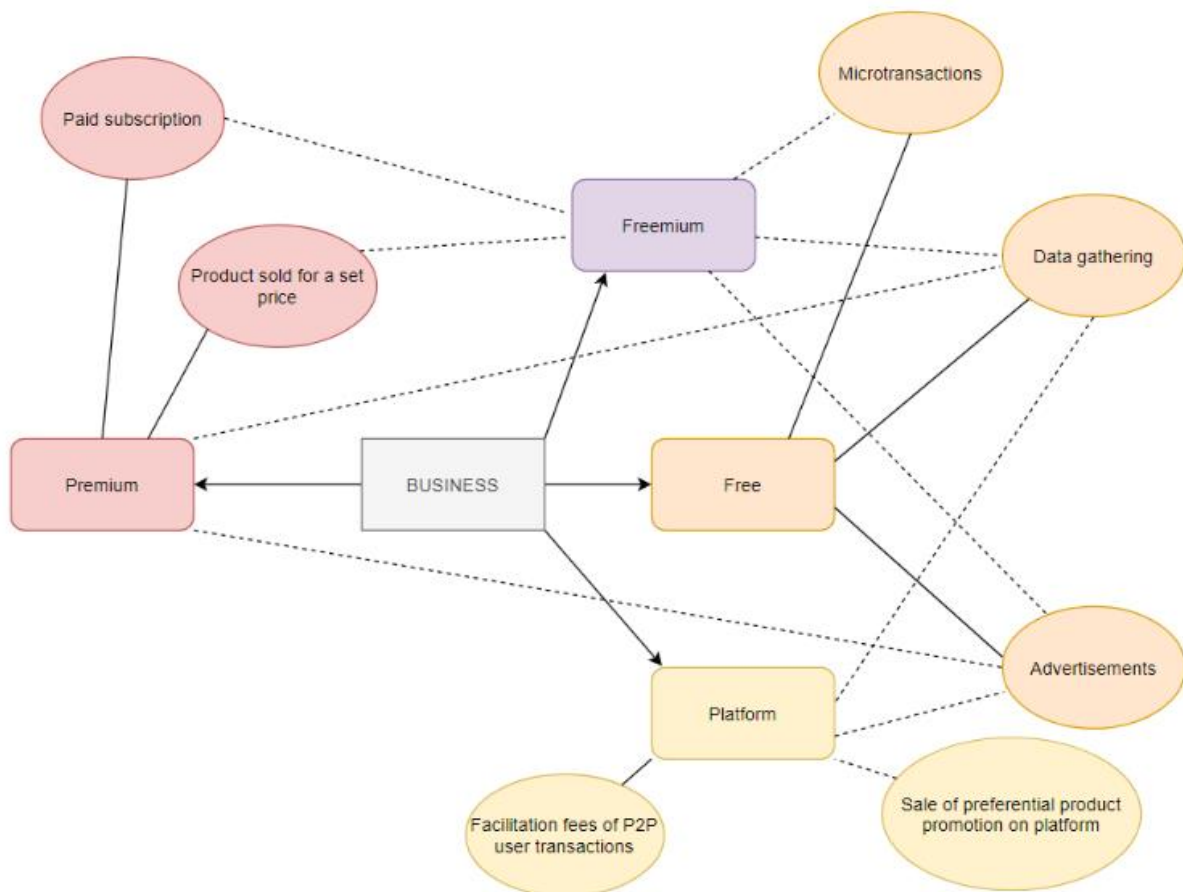


Figure 2: Conceptual framework of digital product business models and associated revenue sources as parts of value capturing mechanisms.

2.6 Conclusions

Academic and non-academic discussion is yet to completely agree on a universal definition for the concept of a business model. There seemingly exists some parallel operationalized definitions made fit for use in discussing different aspects and disciplines of business studies and economics. The term itself became more widely used following the start of the 2000s and possibly helped by the expansion of digital business models due to developments in information and communication

technologies. Most noticeably the advent of the internet may have played a key role. When discussing business models associated with the sale of digital goods and services, the related academic and non-academic papers, published in the 2010s, seemingly have adopted a definition for their purposes, which sees a business model as the overarching logic a company utilizes to create and capture value in the market. This could be considered a shift from a more process-oriented business strategy approach definition used in the 2000s. Business model as a complete concept can be argued to have transitioned from a framework tool of analysis into a unit of analysis.

There are at least four recognizable base business models widely used among companies engaged in the production and sale of digital goods and services. These models are the premium model, the freemium model, the free offering model, and the platform model. In many cases companies do not rely purely on a single model but rather combine value sources inherent to different models. Especially freemium models widely incorporate revenue models common to free offering models to increase revenues. That being said, enough distinct differences exist when it comes to the value creation and capturing mechanics and logics to warrant at least the four ways categorization. All these main categories can seemingly be divided into subcategories along the differences in how a particular business model has been built in relation to the three categories of business model aspects proposed by Schön (2012).

When it comes to prominence of a given business model, a shift towards favoring free offering or freemium models can be seen across many different digital industries. There are seemingly many contributing factors to this shift but most reasons why free seemingly is preferred over premium among digital products are related to the nature of digital goods and services themselves. Also, the ways in which the markets for digital goods and services operate and how competition takes place within said markets can be considered as contributing factors.

As digital goods and services have grown to encompass a larger share of many different national economies, the industry has understandably influenced both the companies involved in the sale of digital products and economies as whole entities.

Therefore, there have been some distinguished effects from the industry that extend to both microeconomic and macroeconomic levels. There appears to exist implications on the measured productivity growth of companies and industries. Another distinguishable effect can be seen with the competition as the competitive environment of digital products is marked with greater necessity for dynamic capacity to respond to leaps in both technology and business models from competitors around the world in areas of great complexity when it comes to innovation and where capturing competitive advantages is hardly consistent. Another aspect is the rise of winner takes all mentality among some companies which aim to establish a monopoly in the market as a way of dominating the competition.

The digital goods and services industries are an area of interest for scholars of macroeconomics when it comes to the calculation of GDP. While the accounting framework of the GDP can be considered up to the challenge. Especially the rise of free offering business models has increased the reliance on self-reporting by companies in calculating the overall production that can be attributed to it. Furthermore, the lack of direct pricing has raised concerns over the accuracy of price indexes regarding quality of goods and services. Due to these trends there may exist a fairly considerable amount of welfare created by digital services which is not considered a part of the GDP. Another issue is the tracking of digitalized production over national borders as digital services are difficult to distinguish and account for a specific nation of origin as a portion of their GDP.

In general, The economic effects and implications of digital business models are not necessarily only related to companies engaged in sale of purely digital products but it may have implications to a wide variety of industries which are effected or are expected to be effected by the increased digitalization of the world. As companies seek to further utilize the possibilities created by the developing information and communication technologies, some forms of the discussed phenomena may extend to those companies in the future, which further can raise the importance of research to this are. Further research discussion should be conducted for a universally accepted definition of a business model to be introduced. Multiple definitions may contribute to barriers of research and may convolute the applicability of research findings within the studies of economics and consequently the scientific development

may be slowed by the lack of common understanding on the definition. Another major gap in the research has to do with the hidden welfare created by improvements in information and communication technologies and further brought on by the trend of favoring free offering business models of digital goods and services. While the GDP calculation process may not benefit directly from the inclusion of welfare into the equation as that could be considered to be defeating the purpose of GDP as a direct measure of productivity, additional calculations of created welfare should be considered as in many countries growth of GDP may be seen as the most important indicator of economic health. While it by no means should be ignored, development of additional welfare matrixes which could capture the hidden welfare could prove to be useful tools for creation of more accurate and appropriate economic policies for many countries around the world.

3. METHODOLOGY

3.1 Identifying suitable sample markets

The distribution of digital goods and services on the internet is mostly disperse. Due to the nature of the internet there is often no need for a concentrated place akin to a physical store where all potential alternatives are available for consumers. Even when digital marketplaces and stores do exist, they often focus on the sale and distribution of a particular form of digital content. Examples of this could be different online stores for videogames like Steam and the Epic store or different online stores for music like Google Play Music and iTunes. When it comes to computer software in particular, most companies developing said software sell and distribute most of the copies of their products on their own websites built for that purpose. This seeming lack of a centralized market with available data on pricing and other product qualities related to direct competitors can make it difficult to conduct industry wide research.

Fortunately, the markets for mobile applications are different. A large portion of all mobile phones around the world use one of two dominant operating systems iOS which is the operating system of Apple products or Android which is the operating system used by phone producers like Samsung, Huawei, and Google among others. This has led to the fortunate situation where most digital goods and services in the

form of downloadable applications are sold and distributed on a centralized market platform. These market platforms are commonly known as Apple App Store and Google Play Store respectively.

Most of the digital goods and services sold for the mobile platforms in the form of applications are sold and distributed on these two market platforms. This near monopoly situation makes researching Google Play Store and Apple App Store as example markets of digital goods and services not only possible but also relatively popular among scholars. According to Statista (2019), there were approximately 2,57 million applications available for consumers on Google Play Store alone making it the largest app platform in terms of total available digital products Apple App came second with 1,84 million available applications. Especially with the most popular applications there are often versions available for both platforms so there exists some overlap of applications between the markets. On a surface level it can be seen that all main categories of digital business models are present on both platforms. Distribution of premium, free, freemium, and platform applications is being facilitated with Google and Apple taking a portion of revenues captured by the companies using their platforms as storefronts. Another benefit to the centralized platform markets is that the product categories available are extensive from casual mobile games to electronic finance applications instead of all digital applications available falling into a specific niche.

Due to the aforementioned reasons Google Play Store and Apple App store present somewhat empirical, and above all practical, example markets for the purpose of the thesis research on digital goods and services and their business models.

3.2 Limitations of available data

Although Google Play and Apple App store hold great potential for research for the thesis, the nature of the markets and to some extent the companies behind the platforms pose some considerable obstacles in terms of gathering of primary data for the thesis. In brief the issues are as follows:

- Lack of publicly available accurate data from the platforms themselves
- The difficulty and skill requirements of gathering extensive primary data

- Lack of applicable pre-existing external datasets

The following will briefly expand on these barriers of data gathering.

Firstly, it is apparent that both Google and Apple hold accurate data in high value when it comes to information relevant to the thesis research like accurate amounts of downloads or accurate revenues generated by individual digital products on their platforms. Due to competitive reasons only the companies who sell and distribute their products on the platforms have access to the metrics of their performance on the platform and even then, only for their own apps with limited comparability with direct competitors. Both platforms do publish ranking lists which indicate comparatively the varying amounts of downloads applications have gained on their platforms and a form of revenue gathered –ranking for applications. Unfortunately the calculations that determine the ranking of a particular app are not clearly available to the public which could indicate that some form of promotional aspect for certain applications can present on the rankings as visibility on the platform brought by a high ranking can be considered very valuable to a company regardless of the fact that there may be no correlation between visibility and sales (Liu et al. 2014). Another issue with ranking lists is that they have for a long time been dominated by free applications since downloading a free application is much easier for a consumer than downloading a premium app. The issue with comparing download figures directly is that there is no difference between an individual who downloads and app and uses it once before deleting and an individual who becomes a paid user of a free app somehow. There are separate rankings for premium apps but direct comparison is still fairly difficult if at all viable since the magnitude of success between top free application and top premium application may be momentous. The lack of publicly available and specific data makes it difficult for an individual researcher to gather applicable data for a deep analysis looking for empirical correlations between a specific business model and commercial success on the platform.

Secondly, despite the stinginess with which Google and Apple are willing to share statistics and data, gathering a dataset which could be utilized for research from even the available data points like price, name, and user reviews can be difficult.

Considering the large amount of available applications, an ultimately representative sample gathered by hand would take a very long time especially given the limitations

of the thesis process. The data could be collected using a data gathering method known as data scraping, but it requires a working knowledge of a coding language like Python to be made viable. Even then the process would be expected to be time consuming and requiring some computation power not currently available to the author for thesis purposes.

Thirdly, while some datasets do already exist, which have mostly been gathered using Python data scraping or a similar process, they are not often released to the public for research purposes as they are large in size and tied to a specific time of gathering and compilation for a specific purpose. Many datasets are gathered by consultancy companies as an information asset sold as a part of the service they provide to paying customers. Examples of companies which gather these kinds of datasets would be 42matters (Google Play Store; www.42matters.com) and Appannie (Google Play Store and Apple App Store; www.appannie.com) 42matters for example, explicitly lists bulk app data as one of their paid products on their website, with the main focus of their business being providing “App Intelligence” and industry insights to buyers which in turn in all likelihood references companies in the App industry looking for insights for competition purposes. Similar websites and companies are plentiful and can easily be found through a simple Google search.

After searching the internet and many dataset sharing websites, there were only one extensive dataset made for each of the platforms available that was free and easily accessible. Although they were uploaded to the internet relatively recently and had a large enough sample size to be utilized to some extent, due to them being gathered by what could be presumed to be data gathering hobbyists for non-academic purposes, the author deemed them untrustworthy for the purposes of the thesis as the results should be based only on academic and professional sources. Another issue was the perceived lack of detail when it comes to describing the sampling method associated with the gathering of the datasets in the first place. For these reasons the decision was made against utilizing the datasets in questions. Both datasets can be found on Kaggle.com and the links for the sets are as follows:

Google Play Dataset: www.kaggle.com/lava18/google-play-store-apps

Apple App Store dataset: www.kaggle.com/ramamet4/app-store-apple-data-set-10k-apps

For these aforementioned reasons, basing the research solely on primary data is unfortunately not viable given the time and resources constraints. Therefore, the analysis will mainly be based on secondary data from previous studies of the sample markets. It is highly likely that approaching the research as a process of meta-analysis should provide enough information in order for the research to uncover some pertinent conclusions related to the research questions and objectives of the thesis.

3.3 Meta-analysis approach

Because of the considerable difficulties in gathering extensive and primary data, the most convenient approach to the methodology of the thesis research is having to mostly rely on previous academic studies and their datasets as a reference point in order to gather relevant information on an applicable digital app storefront. Many studies have been conducted on different aspects of these platforms which makes meta-analysis a viable approach. There are also some sources like Statista and a website named Appbrain which can provide up to date statistics on the current situation of both of the store platforms for research and comparison purposes of the thesis. Using both previous academic works and current statistics a good amount of relevant insight can be gathered.

Following is an overview chart listing all the relevant studies and information sources used for research purposes of the thesis. Following the chart and relevant notes is a more in depth description of each source with references available.

The condensed list of the studies used in the research analysis portion of the thesis:

Author/Study:	Year:	Country:	Platform:		Time period observed:	No. Observations:
			Google Play Store:	Apple App Store:		
Roma and Ragaglia	2016	Italy	Yes	Yes	Late 2012 / Early 2013	2 177
Liu, Au, and Choi	2014	U.S.	Yes	No	Late 2011 / Early 2012	2 928

Cecere, Le Guel, and Lefrere	2020	Global*	Yes	No	June 2015	475 787
Appbrain	2019	Global**	Yes	No	Late 2019	2 749 387***
Statista	2020	Global**	Yes	Yes	Late 2019 / Early 2020	2 570 520/ 1 837 631***

Notes on the listings:

*: Although the authors of the study are French and operating out of a Parisian university, the sample data was gathered by an American research project. Therefore it is highly likely that the data gathered was not from the French storefront but rather the U.S. version of the store.

**: If “country” research setting is marked as “global” this is due to the study examining the storefront in question as a whole from a global perspective rather than gathering information from a single country specific version of the marketplace in question. This version of course when combining all the markets together, tends to be similar or favor the large country markets such as the U.S. and the major Asian markets rather than smaller countries and markets. If the version is not explicitly stated the assumption is that the storefront being observed is the “global version”.

***: As both Appbrain and Statista aim to gather the total amount of applications available in the storefronts being observed the sample size is large, but the observations are mainly categorized along a small amount of key differentiating factors such as whether an application is initially free or a premium app. The data is gathered with no clear study purpose in mind beyond presenting descriptive statistics on the platform storefronts as entire entities.

Below can be found the references to each source with a brief description of the data sample gathered and observed if applicable:

Reference:

Roma, P., Ragaglia, D. (2016) ‘Revenue models, in-app purchase, and the app performance: Evidence from Apple's App Store and Google Play’, Electronic Commerce Research and Applications, 17: 173-190.

Description of sample data:

The authors over a period between 2012 and 2013 at weekly intervals recorded a random sample of applications from the 200 highest grossing apps from the Italian version of Google Play store and constructed descriptive statistics on the business models of the applications dividing them into three main categories of paid (premium), free (free offering), and freemium. The sample utilized was used to capture a total of 2177 observations with 1174 of them being from the Apple App Store and the rest 1003 coming from the Google Play Store. Assuming the Italian version of the Google Play store is not entirely different from other national versions of the digital storefront, the descriptive statistics of the random sample can be utilized as a descriptive sample of the market as a whole when it comes to highest grossing ranking. This assumption is made due to the fact that in most national storefronts, the highest grossing applications are often either the same app or a localized version of a globally popular app. In western digital markets, the language at which digital goods and services are sold is more often than not English even when the national language may differ with translated versioning being prominent through implementations of different settings after the initial purchase has been made. Also, there are seemingly no explicit reasons why the Italian versions of mobile application stores would drastically differ from other national versions like the U.S. version when it comes to the business model utilization within said platform. Therefore, the Italian market can still make for an applicable sample for the purposes of the thesis.

Reference:

Liu, C., Au, Y. and Choi, H. (2014) *Effects of Freemium Strategy in the Mobile App Market: An Empirical Study of Google Play*. Journal of Management Information Systems, [online] 31(3), pp.326-354. Available at: <https://www.tandfonline.com/doi/full/10.1080/07421222.2014.995564> [Accessed 16 March 2020].

Description of the sample data:

The authors collected daily data from November 2011 to January 2012 from Google Play store from the Top Free, Top Paid, and Highest Grossing rankings. Using this data, the authors determined whether the Top Paid apps had a free version or

whether they appeared in the Top Free apps list as well. The sample contained 1,567 paid apps, 1,740 free apps with the business model off the applications being further divided into paid (premium), free (free offering) and paid with a free version (freemium). As the research was conducted in the United States it would appear that in this case, the United States version of the Google Play Store was used to conduct the research in question.

Reference:

Cecere, G., Le Guel, F. and Lefrere, V., (2018) '*Economics of Free Mobile Applications: Personal Data.*' SSRN Electronic Journal, [Online] Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3136661 [Accessed 10 March 2020].

Description of the sample data:

This research covered a large sample taken gathered by an independent third party called Privacy Grade which consisted of 475,867 mobile apps from Google Play Store. The sample was gathered for the purposes of the study in June 2015. This research is included to gather information from Google Play in general as the authors lay out important statistics for examining the relevance between highest grossing rankings and the store platform as a whole.

Reference:

Appbrain (2020), Google Play and Android statistics Available from: <https://www.appbrain.com/stats> [Accessed: 7 March 2020]

Description of available data:

Appbrain is a service that can provide some key statistics relating to the Google Play Store regarding different variables like the rate of free apps versus paid apps on the store front as well as some current ranking statistics of all the apps available.

Reference:

Statista (2019), *App Stores – Statistics & Facts* Available from: <https://www.statista.com/topics/1729/app-stores/> [Accessed 8 March 2020]

Description of available data:

This page contains relevant up to date statistics on the digital storefronts being examined for research purposes. These statistics include but are not limited to the rate between initially free and premium applications and the distribution of premium applications to distinct price categories.

The aim is to, assuming that the sampling of the previous academic studies is considered descriptive of the market platform as a whole, construct some indicators of business model utilization trends and track if any transition has happened from late 2011 to early 2020 when it comes to favoring a certain business model. Unfortunately previous academic work related to monetization and business models of digital goods and services do not make a concrete distinction of the platform business model being a separate business model entirely but include potential platform applications into the free category as the initial application for a platform business model is almost universally distributed for free to the consumer.

4. RESEARCH AND FINDINGS

4.1 The availability of different business models

From the available data we can construct some key indicators of companies utilizing business models of premium, freemium, and free offering. Most of the relevant research has seemingly been conducted at early 2010s but it can be used to provide a reference point for comparison to the current situation.

A thing to note, when it comes to utilizing the two samples gathered by Liu et. al. (2014) and Roma & Ragaglia, (2016) is that there is no distinction present for platform business models specifically. Even though the platform business model constitutes its own distinctive business model, the innate purpose of the research used for the meta-analysis did not make a specific business model category purely to include the platform business models as a separate entity. This is understandable as their research may not have seen the distinction as relevant for their research purposes. Because of the emission of platform business models from the sample

data, the thesis research will also mainly focus on the business models of free offering, freemium, and premium.

It can be assumed however, that all platform business models, present at the time the sample data being used was gathered, are included in either the free offering category or in some rarer cases into the freemium business model category. This is due to the fact that a platform business model is often reliant on a large user base for it to be profitable for a company to operate a service of its kind. This means that a vast majority of platform businesses do not require an upfront payment the likes of which premium business models demand as this would, in all likelihood, limit the potential user base of the service. Therefore, although platform business model is one of the distinct business model categories laid out in the conceptual framework of the literature review, the differentiation for research purposes between free offering, freemium, and platform business models is not possible due to its emission from the data used in the analysis.

Despite the data being analyzed not entirely conforming to the categorization of business models presented in the literature review, the statistics of the samples on offer still provides a good amount of relevant information which makes it possible for the research to carry forward without a necessity for the inclusion of platform business models as separate entities.

Findings of Liu et. al. (2014)

The sample from late 2011 to early 2012, (gathered by Liu et. al. 2014), does not explicitly provide the associated descriptions and statistics of specific business models of the apps in the sample but the necessary information can be derived from the information given. The data from Liu et. al (2014) indicates that they tracked, in total, 1,567 paid apps, 1,740 free apps on the top ranking of free, paid and total grossing rankings. Out of these figures the amount of purely premium apps was determined to be 547 as from the total paid apps 1020 had a free version available. Due to the nature of the research and how the related top rankings are presented, 379 of the distinguished free apps were seen on the top free ranking, therefore, in order to avoid the duplication of apps with different business models, we subtract

these freemium version apps from the total of free apps, which reduces the amount to 1361. This brings the total of apps in the sample to 2928.

$$1361 \text{ (Free offering)} + 1020 \text{ (Freemium)} + 547 \text{ (Premium)} = 2928 \text{ (Total Apps)}$$

From this we can approximate the percentages of different business models from the total. (Rounded to the closest tenth of a percent.)

$$\text{(Free offering)} / \text{(Total Apps)} = 46,48\%$$

$$\text{(Freemium)} / \text{(Total Apps)} = 34,84\%$$

$$\text{(Premium)} / \text{(Total Apps)} = 18,68\%$$

$$\text{Total} = 100\%$$

From these percentages we can make the following observations pertaining to the observed time period. Free offering business model constituted the largest single business model being utilized with freemium being the relatively close second. Utilization of a purely premium business model was the smallest portion of the applications with approximately 20 percent of the applications on the market utilizing a premium model. This can be concluded assuming that the ranking lists being examined in the initial research paper were reflective of the utilization rates of different business models witnessed in the market at large. These figures also show that the rate of initially free applications is approximately 80 to 20 with the combined percentage of free offering and freemium applications making up 81.32 percent of all applications while premium applications only count for 18.68 percent.

Total:	Free offering	Freemium	Premium
2928	1361	1020	547
Percentages:	Free offering:	Freemium:	Premium:
	46,48%	34,84%	18,68%

Table 1: The total amounts of apps of different business models and the relative percentage size of the business model utilization on the Google Play Store as per the data from Liu et. al. (2014)



Figure 3: The relative percentage differences in business model utilization on the Google Play store as per data from Liu et. al. (2014).

Findings of Roma and Ragaglia (2016)

The study conducted by Roma and Ragaglia, published in 2016, offers us a look at descriptive statistics of the Google Play and Apple App Store gathered before the halfway mark of the century a year or two later compared to the data from Liu et. al. (2014). The authors of the study fortunately provide table for outright descriptive statistics of their sample, which will be utilized for the purposes of this research. (See appendix 1.) From this table of descriptive statistics, the following information regarding business models of applications being sampled can be collected.

Total:	Free offering	Freemium	Premium
2177	53,88 %	18,74 %	27,38 %
Apple App Store:	Free offering:	Freemium:	Premium:
1174	57,32 %	10,22 %	32,45 %
Google Play Store:	Free offering	Freemium	Premium
1003	49,85 %	28,71 %	21,44 %

Table 2: The total amount of applications sampled, and the rates of business models utilized by the applications, as per the data from Roma and Ragaglia (2016)

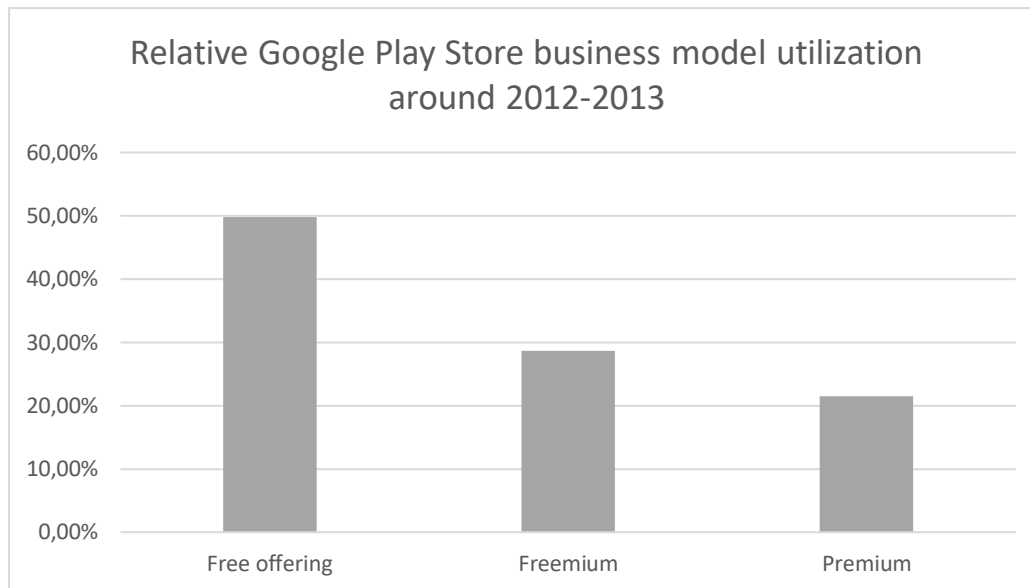


Figure 4: The relative percentage differences in business model utilization on the Google Play store as per data from Roma and Ragaglia (2016).

From these figures it can be determined that the approximate rate of initially free versus premium application on The Google Play Store at the time examined by Roma and Ragaglia (2016) is approximately 78,56% of apps being initially free for download and 21,44% requiring a purchase fee to be downloaded by consumers. This fairly closely resembles the sample of Liu et al. (2014) as far as the Google Play Store. In addition, the sampling done by Roma and Ragaglia provides the respective rates of business model utilization for the Apple App Store where seemingly a larger portion of the highest grossing applications rely on a premium business model. The freemium model is also noticeable less prominent on the Apple App store.

Findings of Cecere et. al. (2018)

In the research conducted by Cecere et. al. (2018) it is stated that at the time of writing around 2015 there were approximately 1 292 029 free applications available on the Google Play Store and that in total free applications constitute approximately 85% of the total amount of applications available. This implies that there existed a noticeable disparity between the rate at which initially free and premium business models were utilized in total and the rate at which applications reach the highest grossing rankings. In light of this information it would seem that premium business models were relatively overrepresented among the highest grossing applications. There may therefore be evidence of market saturation of initially free application

present or rather that premium business models on average can be expected to be higher grossing when compared to the initially free business models.

In total from the research samples discussed above we can determine some key insights. The most common business model among highest grossing at the time was free offering with freemium quantitatively contributing about a half the number of apps compared to free offering business models. When it comes to highest grossing apps, premium applications contributed about 20% of the applications quantitatively below both free offering and freemium respectively but at a higher rate than the market share premium applications had in terms of availability. During the period around 2015, the rate at which premium monetization model was utilized in the Google Play Store among highest grossing applications was above 80 percent while in total approximately 15 percent of all applications required an initial fee from the consumer to be made available for download.

Findings from Appbrain and Statista sources

Currently in the last five or so years there have been changes to the situation specifically in the case of the Google Play Store. According to Appbrain (2019), there are in total 2 749 387 applications available in the Google Play Store (As of March 2020). Therefore, the total amount of applications has grown by approx. 112,80% in the last 5 or so years. Another interesting statistic is that at the time of writing 95,8% of all applications are initially free for the consumer with premium apps only contributing around 4,2% of all applications. Statista has also conducted similar research on the disparity between initially free and premium applications for the start of the year 2020. According to Statista (2020) in the first quarter of 2020 as much as 96,2% of available applications on the Google Play Store are initially free versus only 3,8% of all applications being premium. This disparity is also expected to continue favoring free applications even more over premium ones as time goes on.

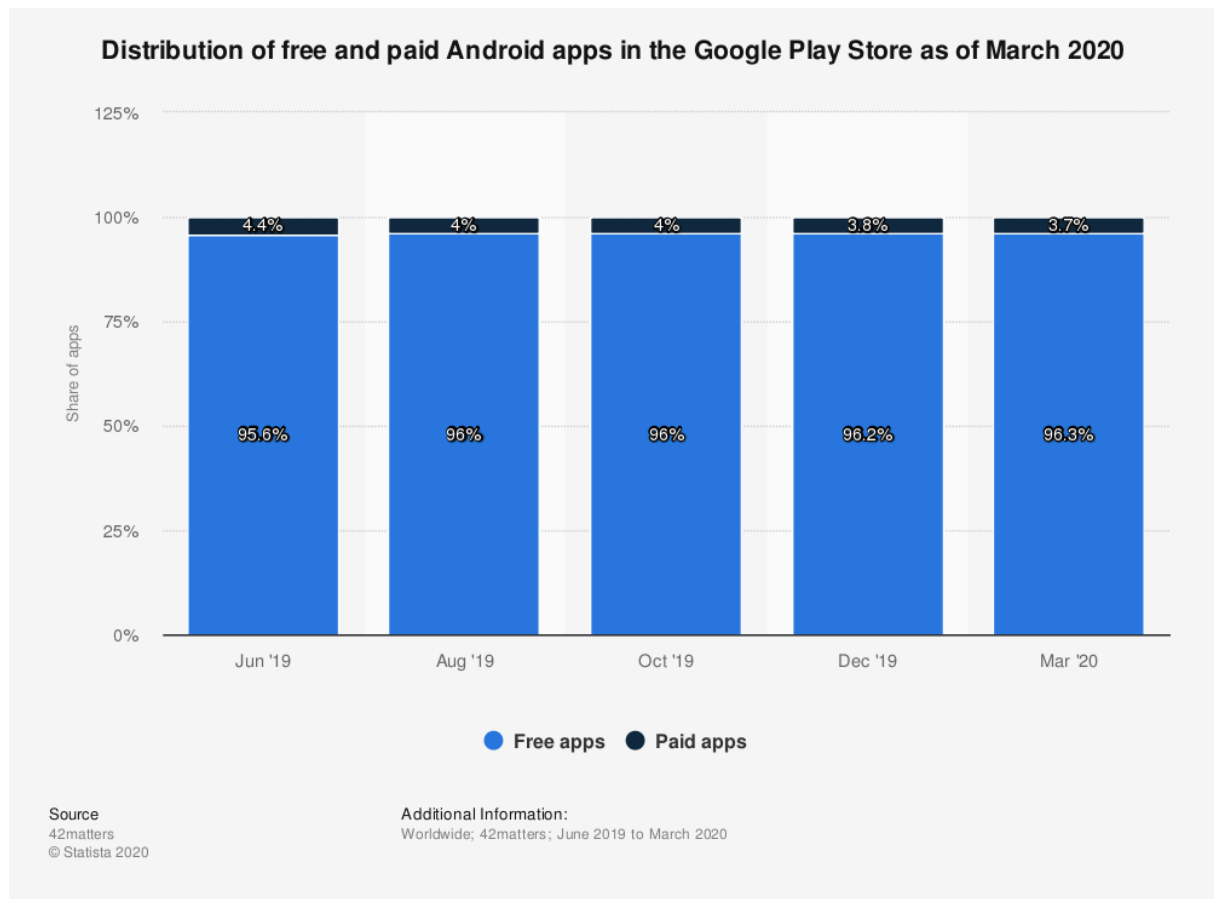


Figure 5: The relative percentage differences in free versus premium business model utilization on the Google Play store as per data from Statista (2020).

Similar statistics are available for the Apple App Store as well. According to Statista (2020), while initially free applications do contribute the overwhelming majority of all available applications on Apple App store as well, the distribution is somewhat less drastic. Applications with a premium business model contribute to 9,3% of all available applications which is almost three times the same rate perceived on the Google Play Store.

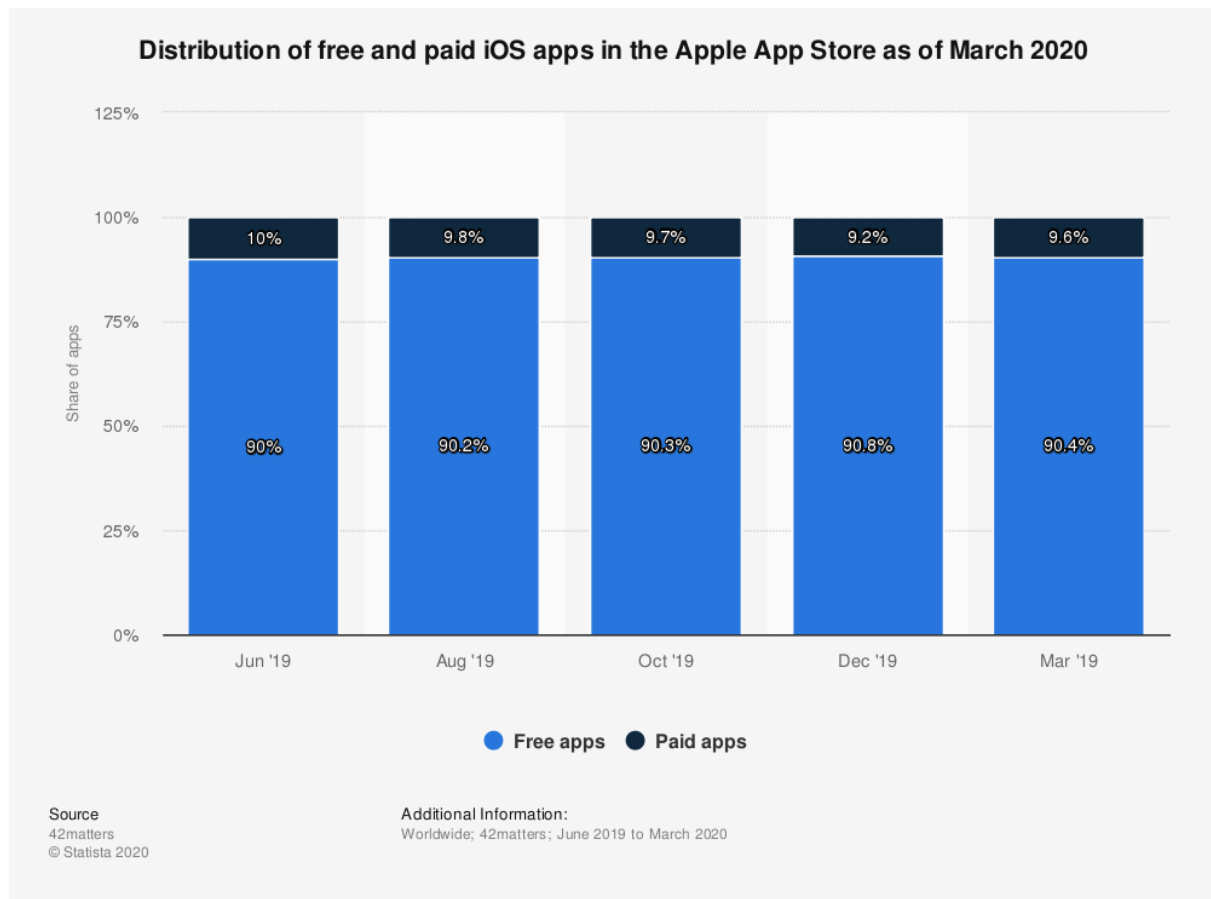


Figure 6: The relative percentage differences in free versus premium business model utilization on the Apple App Store as per data from Statista (2020).

It should be noted that quantitatively there are less available applications on the Apple App Store compared to the Google Play Store. In quarter 4 of 2019 the amount was 1 837 631 (Statista, 2020), which is just under a million less than the amount of applications available on Google Play Store concurrently.

4.2 The average price of paid applications

Statista (2020) provides some estimates of the price ranges of premium applications that are available from the Google Play Store. From this information we can calculate an approximation of the average price of a paid application in the storefront to see whether even the paid applications favor low initial prices to entice consumers. This may be indicative of the free alternatives driving down the prices of the premium applications although it must be stated that the cause and effect relation may only be partial as other unknown factors may also contribute to any perceived low average price.

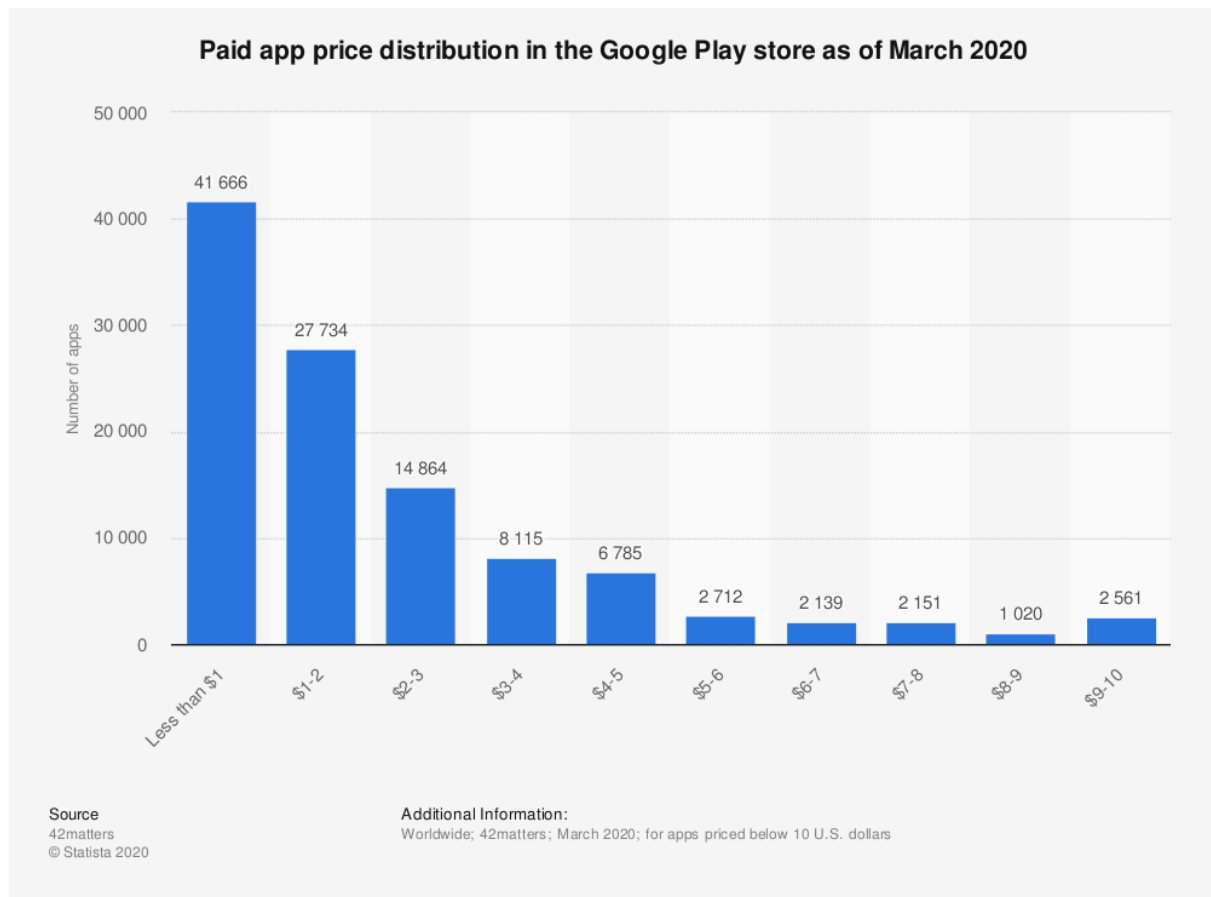


Figure 7: The distribution of available premium applications according to price range on the Google Play store as per data from Statista (2020).

On the Google Play Store the average price for a paid application, among applications costing under \$10, the average price is approximately \$2.15. This average price was calculated by multiplying the amount of applications in a given category by the halfway price of the given category. After this all the categories combined were divided with the total amount of premium applications available. Due to the perceived lack of more accurate figures it can be expected that this average price figure is not a perfectly accurate representation of the real average price on the platform as this calculation assumes a relatively equal distribution of prices within a given price category. In reality it can be expected that especially in the low price categories the prices of applications within said category are skewed towards the upper limit of the category, i.e. in the category below \$1 it is highly likely that a disproportionate amount of applications are sold at \$0.99 price point rather than being sold just above \$0.01. Prices close to zero are likely to be very rare as demanding a low payment from a consumer may only pose a barrier of entry without

a large revenue incentive for the company selling the application in question. If the same calculation is done by multiplying the amount of available applications with the upper limit of a given price category the result is approximately \$2.65. The real value of the average price of a given application can be assumed to be found between these two values closer to the upper-limit average.

When doing the same calculations of midpoint average and the high-end average we get an approximate average price of \$2.27 which is approximately 5.58% higher average midpoint price than the one perceived with the Google Play Store. The average price at the upper limits of the price categories comes to approximately \$2.76 for the Apple App Store. Despite there being significant overlap in the average ranges between the two storefronts, assuming the pricing strategies companies use are similar on both platforms among paid applications, i.e. prices being skewed towards the upper limit of a given price category, it can be assumed that it is fairly likely that the average price of a paid application tends to be higher on the Apple App Store compared to the Google Play Store.

On the Apple App Store the average price of applications is seemingly being slightly higher could be an indicator that the trend towards favoring initially free or increasingly cheaper digital goods and services is less of a trend with Apple App Store. At least it can be argued that premium business models seem to be more viable on the Apple App Store according to these statistical results especially when the larger rate of premium applications available on the platform is taken into account.

The fairly low average prices of premium applications on both Google Play Store and Apple App Store respectively, may be representative of the fact that even when an application requires an initial fee, the premium prices are skewed to favor low prices rather than there being an expectation of consumers paying a price largely above 3\$. Therefore, even an application is utilizing a premium business model prices have a tendency to be quite low in a digital goods and services market dominated by products utilizing a free business model.

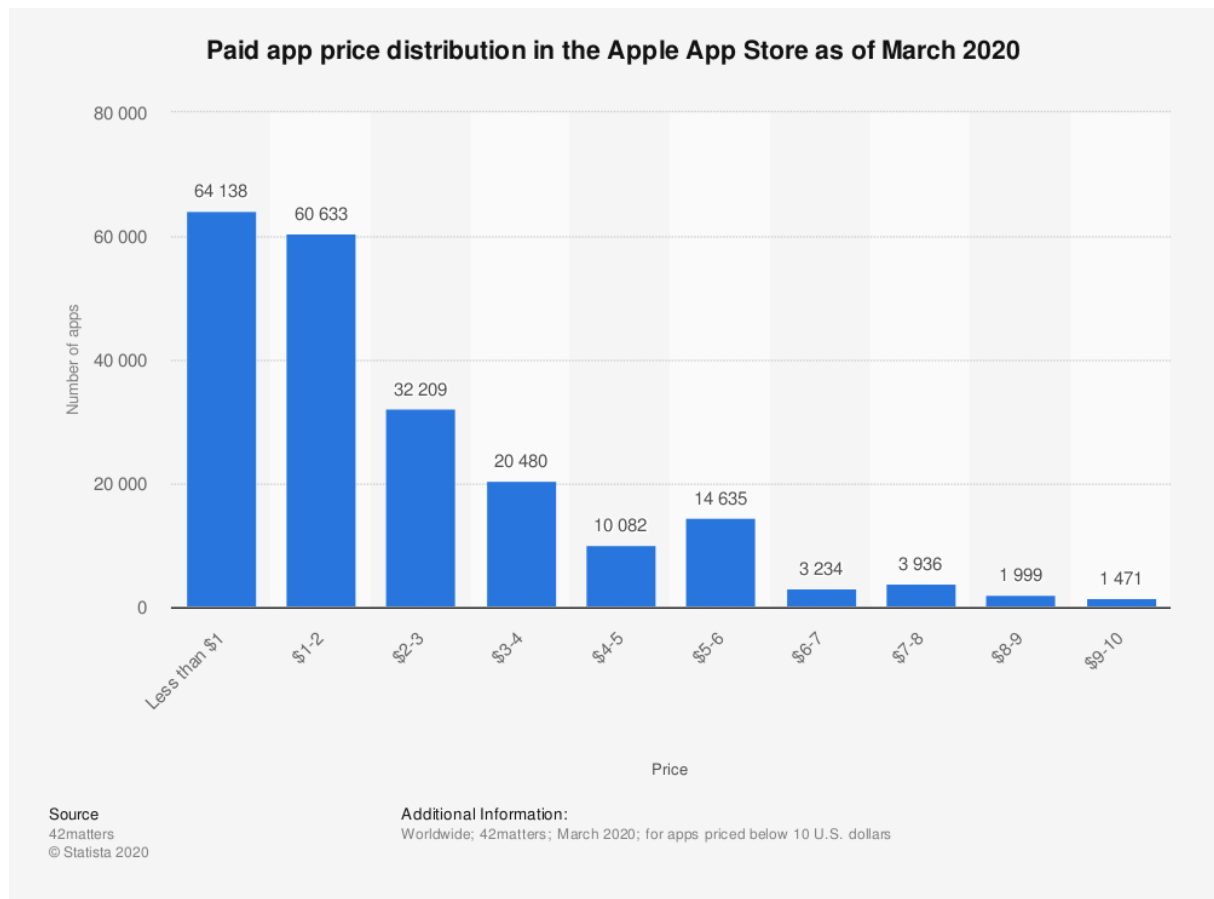


Figure 8: The distribution of available premium applications according to price range on the Apple App Store as per data from Statista (2020).

Calculations:

Midpoint average price:

$$\frac{N(\text{category } 1) * P(\text{midpoint of cat. } 1) + N(\text{category } 2) * P(\text{midpoint of cat. } 2) \dots}{\text{Number of apps in total}}$$

$N(\text{category } x)$ = The number of applications on the price category x .
 (Categories were determined according to the representing figure i.e. category 1 = "Less than \$1"; category 2 = \$1-2 etc.)

$P(\text{midpoint of cat } x)$ = the midpoint between the highest and the lowest price in a given price category x .

High-end average price:

$$\frac{N(\text{category } 1) * P(\text{high} - \text{end of cat. } 1) + N(\text{category } 2) * P(\text{high} - \text{end of cat. } 2) \dots}{\text{Number of apps in total}}$$

P(high-end of cat. x) = the upper limit of prices in a given price category x.

4.3 Relationship between content and business model

From the dataset compiled by Roma and Ragaglia (2016) (N=2177) we can make some observations on what type of content of a digital good or service can be associated with a certain type of business model. In addition to dividing all the sample applications according to the business models i.e. whether a given application utilizes free offering, freemium, or premium business model, the researchers have also noted the content category of a given application. This has divided the applications in the sample into categories of Games, Social Network, Money and finance, Photo and video, Entertainment, Education, Healthcare and fitness, Music, News and magazines, Utility, Customizations, and Travel and navigations. (See Appendix 1.) These or similar categorizations are commonly made by the store platforms themselves in order to ease browsing for customers, but the categorization is also relevant to the expected content of an application.

In the descriptive statistics for their research Roma and Ragaglia (2016) it is described which business models can be associated with certain content categories and to what extent a category utilizes a certain business model. A percentage rate of a given content category and business model combination is calculated as a portion of all applications available. For example, it is shown that out of all of the applications in the total sample, content category of games constituted 57.74% percent of all of the applications that were observed. Games using the free business model constituted 45.02% of the total sample with premium and freemium business model games contributing 8.68% and 4.04% respectively. It is also shown that 53.05% of games applications contained some form of in-app purchases. In-app purchases being in reference to the monetization method of having the consumer buy some form of utility inside the product or service which may, for example, offer a virtual item or

expediate the progress in a game which otherwise would force the player to wait an arbitrary amount of time before allowing further progress to be made. In-app purchases in most cases take the form of micropayments but in the dataset it is not explicitly clear whether the option to upgrade to a premium version of an application from the free version, typical for a freemium business model, is counted towards the total of applications containing in-app purchases. For the purpose of the research the in-app purchases are not taken into direct consideration as almost all business models may utilize some forms of in-app purchases.

From these statistics provided we can determine some content categories with large amount of particular business models being utilized. This may prove valuable in determining what type of content is usually utilizing an initially free business model versus what type of content utilizes a premium business model.

Category:	% of total apps:	Free offering:	Freemium:	Premium:
Games:	57.74%	45.02%	4.04%	8.68%
Social network:	4.59%	3.67%	0.92%	0.00%
Money & Finance:	0.92%	0.00%	0.92%	0.00%
Photo & Video:	4.59%	0.60%	0.00%	3.99%
Entertainment:	0.92%	0.92%	0.00%	0.00%
Education:	3.67%	0.00%	1.84%	1.84%
Healthcare & Fitness:	0.92%	0.00%	0.92%	0.00%
Music:	2.76%	0.00%	2.76%	0.00%
News & Magazines:	3.67%	2.76%	0.00%	0.92%
Utility:	7.35%	0.00%	3.67%	3.67%
Customizations:	3.67%	0.00%	1.84%	1.84%
Travel & Navigations:	9.19%	0.92%	1.84%	3.41%

Table 3: The percentage of different categories of applications present in the data sampled and the further rates of applications with specific business models as per data from Roma and Ragaglia (2016)

The most notable category of content is the games category as over half of the applications in the sample are games of some kind in terms of content description. The division rates of business models are similar to the overall markets with the vast majority of games applications utilizing either a free offering or a freemium business model with free offering being the overwhelming business model of choice. Premium

business model utilization on the other hand is relatively low at 8.68% which is relatively larger than the premium business model utilization rate of the market in general at the time at around 15%. Similar distribution of utilization rates, where most of the applications are free, are also present in categories such as social network, entertainment, and news & magazines. It is also important to note that all applications from the music category exclusively utilized a freemium business model which is reasonable assuming the dominant business model in the digital music industry is akin to Spotify, Tidal and similar digital services. Social networks in general did not utilize a premium business model which is understandable as social network services should be expected to derive value from a large user base which is typical for a platform business model. Therefore, it could be against the best interests of social network companies to restrict the entry of new users by demanding an upfront fee from new users.

On the other hand, there are some categories where a large amount of the applications in the sample utilize a premium business model. These categories are photo and video, education, utility, customizations, and travel and navigations. It should be noted that in the categories of education and utility the amount of premium and freemium applications available was the same but there were no explicitly free alternatives in the market at the time.

These results would seemingly indicate that there may be some causal relationships apparent between some specific content categories and the prevalent business models utilized by applications in each category. For example, the largest number of paid applications, after the “games” category, was in the photo and video category followed by the utility category. In general, it would seem that premium business models are more often utilized with products which are not necessarily made for purely consumer entertainment purposes.

In their paper on the effects of freemium model in the app market Liu et. al. (2014) divided the applications available into hedonic and non-hedonic applications (Liu et. al, 2014). A similar division may tentatively predict the favored business model utilization at least in early 2010s then Roma and Ragaglia conducted their research. Especially the utility applications using premium business models would indicate that

non-hedonic applications, which are downloaded for purposes other than pure entertainment tend to favor a premium business model instead of a free offering or a freemium model. Meanwhile most of the hedonic application content categories tend to favor free business models. The difference between hedonic and non-hedonic applications as defined by Liu et. al. (2014) being that hedonic applications are used for entertainment purposes whereas non-hedonic applications serve an additional purpose and provide utility to a consumer beyond pure and subjective entertainment value.

Overall, it seems to be the case that in non-hedonic content categories premium business models are more prevalent than in hedonic content categories, at least in the sample of Roma and Ragaglia. This can make intuitive sense as the ulterior utility provided by a non-hedonic application may make it a necessity for a consumer in some situation. Therefore, it may have led to scenarios where acquiring an application for a monetary price is less of an issue for a consumer compared to a case of having to pay upfront for a hedonic entertainment app. One issue with this hypothesis however is that photo and video applications may not be explicitly non-hedonistic which in turn raises further questions into why so many photo and video applications use a premium business model. Whether this is due to there being many professional photographers or videographers buying paid applications for work purposes or there being an anomaly in the data of average consumers buying paid photo and video applications rather than having free alternatives available to them is not immediately clear. This could constitute an area of possible future research as the market situation regarding categorization and business models may have remained the same in this regard or the consumers may have gained an access to free alternatives in more content categories the last few years.

4.4 Summary of results and analysis

From the datapoints gathered we can determine a clear trend towards favoring initially free business models in favor of premium business models. While even in early 2010s there existed a distinguishable preference towards not requiring consumers to pay an initial fee for a mobile application, the discrepancy between initially free and premium applications has only grown larger in the late 2010s.

Applications that are reliant on a premium business model have consequently only grown to encompass a smaller than ever portion of all the applications available.

In the early 2010s the discrepancy between available free and paid applications hovered around an 85/15 percent split. On the highest grossing rankings premium applications tended to have a larger part with, depending on the storefront being observed, approximately 20 to 30 percent of the highest grossing digital goods and services requiring an initial paid fee in return for consumer access. Despite this the relative position premium applications and free applications held on the highest grossing rankings may yet play a part as if the highest grossing applications have always been free and the scarce premium application is only cracking the top 100 or so every now and then the relative financial potential of different business models may not be accurately represented by the fact a certain application made an appearance on the highest grossing rankings.

Currently it would seem like a free offering or a freemium business model is the default and most successful business model option in the realm of digital goods and services specifically in the Google Play Store and to a slightly lesser extent on the Apple App Store in regards to the number of available applications. This is most likely the case even though in the last five or so years Google Play Store has doubled the available applications on it, meaning there may exist some oversaturation of free applications. Most certainly it can be assumed that the most trusted upon business model for market entry at least in the last five to ten years has been an initially free digital good or service offering i.e. a free offering, a platform or a freemium business model.

Unfortunately, while there is no question that quantitatively, the dominant business model on these example digital goods and services markets is initially free for the consumer, there is sparse data available whether the rates at which premium and initially free offering applications are available on these platforms correlate with success of applications. Back in the early 2010s, the data shows that the rate at which premium applications were on the highest grossing rankings was larger than the rate at which they were made available compared to free alternatives. This may be another aspect in which saturation of the market may play a part. As discussed by

Lambrecht et al. (2014) digital goods and services can be fairly cheap to produce and distribute. This low barrier of entry into the market may have led to a situation where a large part of the available free applications may be low in quality and may not be financially successful products in the first place. This could skew the statistics into favoring free over premium even when premium business models in general may present a better opportunity for financial success in some cases. Therefore, it may not be advisable to consider free offering or freemium business models to be dominant in all scenarios regardless of the individual context or qualities of a product being developed and released. It may still be viable that a premium business model may be a success in some cases and specifically within some content categories of digital products. Business model may only be a single variable in determining the overall success of a product in the digital markets despite some distinguishable trends of favoritism being present.

This point was implied by the fact that there existed some form of correlation between the content category of an application and the preferred business model. Seemingly free offering and freemium models reign supreme in categories that constitute hedonic products. Premium business models on the other hand were more commonly associable with non-hedonic applications which by definition are made to offer utility beyond entertainment value. At least in the market situation observed by Roma and Ragaglia (2016), there existed a large gap between the amount of hedonic and non-hedonic applications in the market sample. This may be due to there being less competition among digital products which constitute non-hedonic applications or that simply non-hedonic applications within the platforms being investigated by Roma and Ragaglia did not make it to the highest grossing listings from which the sample was taken.

The broad developments and trends as are perceived on Google Play Store can be seen within the Apple App Store as well (Statista, 2020) but there are some key differences between the platforms. It was noticeable that the amount of applications using a premium business model was slightly higher compared to similar business model utilization rates perceived in the Google Play Store. Another noticeable difference was the slightly higher average cost of the paid applications in the Apple App Store. This would seemingly suggest that there may be differences in the two

example markets with the Apple App Store proving to be a better option for companies looking to utilize a premium business model with their digital product. At least the data available seems to suggest that consumers using the Apple App Store are more receptive to buying premium apps and also prepared to pay a slightly higher price for them.

When searching for reasons for these differences, the largest potential difference may be the different approach Apple has to accepting new applications to the Apple App store. The App Store has a larger degree of active curation when it comes to accepting new applications to the platform whereas Google Play has laxer quality screening procedures. Therefore, it could be expected that Apple App Store may turn down some of the free applications which come across as direct copies of pre-existing digital products or which in other ways fall short of any potential minimum quality standards Apple has for their storefront. Whether this helps with any potential issues of oversaturation when it comes to free applications is not explicitly clear, but it may offer a tentative explanation to any major differences on the perceived amount different business models are being used between the two platforms. There are also seemingly differences in the consumer spending behavior assuming of course that the business model situation being perceived is responsive to the user demands somewhat efficiently. As Apple App Store is only servicing hardware manufactured by Apple itself there may exist a correlation between the willingness to spend more money on apps as Apple hardware itself, especially to early adopters of new models, can be very expensive and could at least in theory mean that Apple users have more expendable income for App Store purchases. On the other hand, as Google Play Store is a service used by most phones which use the Android operating system, the hardware and its pricing is more widely scattered and Android phones may be more widely available to some consumer segments which are priced out by Apple hardware. If you assume Android users in general could have less disposable income to spend on digital goods and services, it makes sense that the degree with which initially free business models are favored would be larger on average. This could also explain why, in general, the paid applications on the Apple App Store are slightly more expensive than the premium applications on the Google Play Store on average. Unfortunately, there doesn't seem to exist accurate average customer segment profiles for Apple App Store and Google Play Store which could explain or

prove the existence of any major differences between the average users of the different storefronts.

5. CONCLUSIONS

5.1 Main findings

The main findings of the thesis consist of the theoretical categorization of different business models into the four distinct categories of free offering, freemium, premium, and platform business models. These categories are separated by the distinct differences perceived in the internal value capturing mechanisms of the business models in question. These categories can be used to map out how digital products are monetized with the categories also being distinguishable and differentiable enough for them to have practical value for research purposes.

Based on the research done, it was found through meta-analysis of data gathered for academic research related to applicable example markets that a distinct trend towards favoring free offering and free business models over premium business models exists within the two largest mobile app platforms. Initially free business models were the norm as far back as 2011 and 2012 and in 2020 it appears that initially free business models have only grown to hold a larger share of the market than ever. In general, business models, where the digital good or a version of said good is free from initial monetary price, are seemingly the dominant models in the Google Play Store and Apple App Store when looking at the number of apps available. Although the vast majority of new market entries seemingly utilized an initially free business model, unfortunately there is no clear evidence that there exists a dominant business model which all digital goods and services should adhere to. On the surface, the market and consumers noticeably favor free over paid, as is to be expected with any market, but there may exist further variables beyond perceived price which can make a premium business model favorable for some businesses. One of these variables is most likely the content category of the good or service as hedonic applications on the Google Play Store and Apple App Store tended to favor initially free business models whereas non-hedonic applications, which are meant to

provide utility beyond entertainment value, apparently favored the premium business model more in comparison.

Another finding was that the expected average price of a premium application was slightly higher on the Apple App Store compared to the Google Play Store. This may be down to the different ways these platforms operate in terms of accepting new digital products into the store which in turn adds another variable into determining the success of an individual digital product regarding its business model. Another potential reason may be the differences in customer bases and their respective willingness to spend or the availability of disposable income for premium model digital goods and services. In total it would seem like the Apple App Store may be more hospitable to premium business models of the two observed example markets.

5.2 Implications for International Business

The first implications specific to international business comes in the form of potential new responsibilities. As mentioned in the literature review, a market where price indexes are less and less relevant due to business models not having innate prices set for goods and services, internationally operating companies need to bear further responsibility in the tracking and reporting of their financial key performance indicators from different national markets around the world. In the future responsible and accurate in-house reporting may have implications to many of the most important macroeconomic measurements used by the public sector in determining economic policy around the world.

Any international business engaged in the production and distribution of digital goods and services should pay attention to the direction the markets and preferred business models are heading in order to remain competitive. Innovation focusing on business models specifically as well as other aspects of business evolve rapidly in the world of digital products. Therefore if a business has no free version of their products available the viability of offering such a sample to consumers should at least be considered and the implication of what the research suggests for the future should be taken into account when planning any future digital products and what business model a company wishes to utilize in order to maximize the potential value of their assets.

The digital goods and services industry, in its core, is almost inherently international. This is due to the fact that in most cases, the access to products consumers have is mostly limited by the information and communications technology infrastructure in a given geographical location. As the infrastructure and access to digital goods widens the market for digital products is set to also expand. As most of the developed world already has digital goods and services within their reach, the next frontier is set for the developing nations. In theory these expansions to developing nations should further lead to free business models having better market penetration in these countries. Therefore, the market already transitioning into what is akin to a universal sampling policy when it comes to consumer's gaining access to products, it may face even greater compounding returns as the markets expand alongside technological globalization.

5.3 Suggestions for future research

Optimally a future research project should uncover whether the disparity between paid and initially free business models being made available on digital goods and services platforms is reflected accurately by the highest grossing rankings of said digital products. This research could potentially confirm the dominant models of initial free offering and freemium being empirically superior to the premium business model. This potential result could be utilized in both academic and professional realms as it would indicate a potentially likely direction, digital goods and services industries will need to take in terms of choosing business models for their products. A key aspect of the research could be to discover the difference between the business models of hedonic and non-hedonic applications as this distinction could make a big difference in how companies approach market entry considering whether the digital product on offer is made either for entertainment purposes of the consumer or whether there is utility beyond entertainment on offer when a consumer purchases the product. Entertainment products may face a different competitive environment than non-entertainment products in the digital realm. Non-hedonic digital product markets may even be more similar to traditional goods and services markets in terms of the business models of the companies involved. This may also be the differentiating factor of business model utilization between B2C markets and B2B markets.

Another avenue for future research could specifically concern the platform business models as the value capturing mechanics of these businesses are quite the ways different from free offering and freemium business models. It is also an area which has received less attention from researchers than, for example, the freemium business model. Specifically, the underlying logics dictating that a dominating market position is being considered a goal and somewhat a guarantee of eventual financial viability and success of a platform business mode. The winner-takes-all mentality could and possibly should be researched to see whether it is even possible to expect services like Uber, Airbnb, and DoorDash to be profitable in the long run or are the unicorn investments more or less filled with air rather than actual potential. An interesting question would be whether the company achieving the dominant market position can turn itself profitable while remaining competitive. Some platforms are successful but can the business model support services that go beyond being a storefront like operation.

As the data suggest a trend where an outright initial price for a digital good is less necessary for a business model to be viable and in fact initial price may start to represent a detriment to a business, further research into the influence non-monetary costs initially free business models use to capture value could be done in order to examine the effects these costs exhibit in consumer behavior. If a transition into a market where initial price is not asked for, the effects of non-monetary costs on consumer utility may determine the competitive outcomes in said markets.

In general, a reiteration of the suggestions for future research outlined in the literature review remains relevant. As digital goods and services are more widely used and accessible to more people than before, the economics research into this subject matter ought to become more relevant than ever. Within this context, a transition to a world where considerably sized markets of consumer digital products are left with little attention from academic scholars may lead to a situation where the study of economics is left behind by other schools of business thought.

APPENDICES:

Descriptive Statistics.

	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q	
				Free	Paid			Freemium			In-app					
	Total	Apple	Google	Total	Apple	Google	Total	Apple	Google	Total	Apple	Google	Total	Apple	Google	
Free	53.88%	57.32%	49.85%													
Paid	27.38%	32.45%	21.44%													
Freemium	18.74%	10.22%	28.71%													
In-app	69.59%	71.55%	67.30%	53.28%	56.22%	49.85%	14.47%	13.63%	15.45%	1.84%	1.70%	1.99%				
Games	57.74%	59.11%	56.13%	45.02%	47.70%	41.87%	8.68%	9.71%	7.48%	4.04%	1.70%	6.78%	53.05%	56.22%	49.35%	
Social network	4.59%	5.11%	3.99%	3.67%	3.41%	3.99%	0.00%	0.00%	0.00%	0.92%	1.70%	0.00%	4.59%	5.11%	3.99%	
Money & finance	0.92%	0.00%	1.99%	0.00%	–	0.00%	0.00%	–	0.00%	0.92%	–	1.99%	0.00%	–	0.00%	
Photo & video	4.59%	6.81%	1.99%	0.60%	1.11%	0.00%	3.99%	5.71%	1.99%	0.00%	0.00%	0.00%	0.92%	1.70%	0.00%	
Entertainment	0.92%	1.70%	0.00%	0.92%	1.70%	–	0.00%	0.00%	–	0.00%	0.00%	–	0.92%	1.70%	–	
Education	3.67%	3.41%	3.99%	0.00%	0.00%	0.00%	1.84%	3.41%	0.00%	1.84%	0.00%	3.99%	0.00%	0.00%	0.00%	
Healthcare & fitness	0.92%	0.00%	1.99%	0.00%	–	0.00%	0.00%	–	0.00%	0.92%	–	1.99%	0.00%	–	0.00%	
Music	2.76%	5.11%	0.00%	0.00%	0.00%	–	0.00%	0.00%	–	2.76%	5.11%	–	0.00%	0.00%	–	
News & magazines	3.67%	5.11%	1.99%	2.76%	3.41%	1.99%	0.92%	1.70%	0.00%	0.00%	0.00%	0.00%	2.76%	3.41%	1.99%	
Utility	7.35%	6.81%	7.98%	0.00%	0.00%	0.00%	3.67%	6.81%	0.00%	3.67%	0.00%	7.98%	0.00%	0.00%	0.00%	
Customizations	3.67%	1.70%	5.98%	0.00%	0.00%	0.00%	1.84%	1.70%	1.99%	1.84%	0.00%	3.99%	0.92%	1.70%	0.00%	
Travel & navigations	9.19%	5.11%	13.95%	0.92%	0.00%	1.99%	6.43%	3.41%	9.97%	1.84%	1.70%	1.99%	6.43%	1.70%	11.96%	
Binary variables				Descr. Stat.			Binary Variables						Descr. Stat.			
Store				Total	Apple	Google							Total	Apple	Google	
Company fame				53.93%	100.00%	0.00%	Developer Type						97.24%	98.30%	96.01%	
				21.77%	22.06%	21.44%	High App Rating						78.41%	75.21%	82.15%	
Continuous/discrete variables				Descriptive Statistics												
				Total				Apple				Google				
				Mean	Std.D.	Min	Max	Mean	Std.D.	Min	Max	Mean	Std.D.	Min	Max	
New entries				44.71	15.88	0.00	90.00	48.55	12.44	0.00	60.00	40.21	18.13	0.00	90.00	
Number developer apps				22.15	37.63	1.00	168.00	28.16	47.57	1.00	168.00	15.12	18.27	1.00	69.00	
Size				141.55	354.71	0.02	2355.20	187.12	373.67	1.00	2007.04	88.21	323.27	0.02	2355.20	
Time since market launch (months)				13.17	9.11	0.00	45.00	16.13	11.01	0.00	45.00	9.70	4.01	1.00	25.00	
Rank				239.91	282.18	1.00	1000.00	244.45	299.47	1.00	1000.00	234.59	260.25	2.00	1000.00	

Note that the statistics are computed using all 2177 observations for columns designated as "Total", whereas are computed using only the observations from Apple's App Store (1174) for the columns designated as "Apple" and only those from Google Play (1003) for the columns designated as "Google". Also note that the sign – indicates that it does not make sense to compute the statistics. For instance, the percentage of free apps in the category "Money & Finance" in Apple's App Store cannot be computed because there no apps in such category in Apple's App Store.

Appendix 1: The descriptive statistics table from the (Roma and Ragaglia 2016) study on revenue models and in-app purchases.

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